

ACQUISITION REFORM — A TOUGH SELL

Col. (P) John S. Caldwell, Jr., USA, Spearheads Acquisition Reform Team Effort

May-June 1995

PROGRAM MANAGER

Journal of the Defense Systems Management College

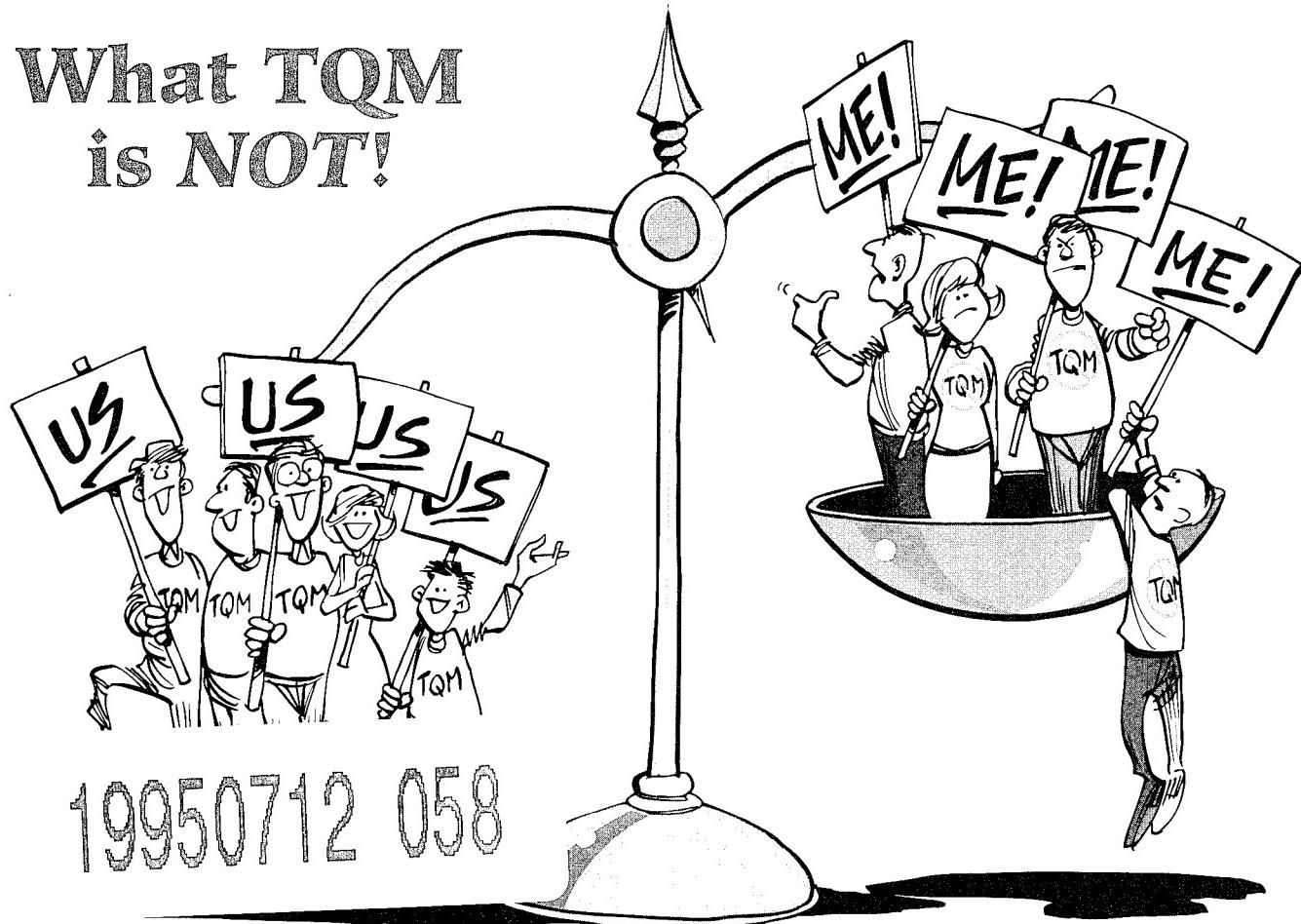
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Longbow

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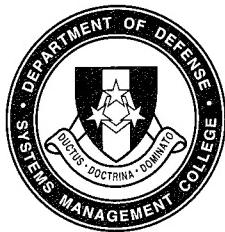
What TQM
is NOT!



PROGRAM MANAGER

Journal of the Defense Systems Management College

Vol. XXIV, No. 3, DSMC 126



Published by the
**DEFENSE SYSTEMS
MANAGEMENT
COLLEGE
PRESS**

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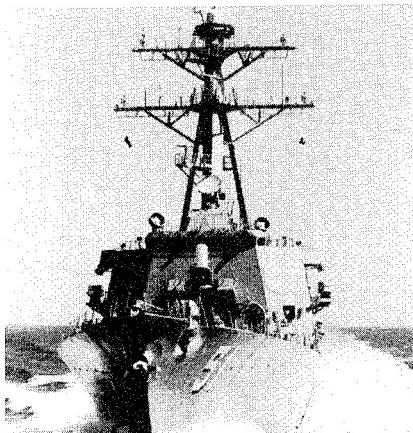
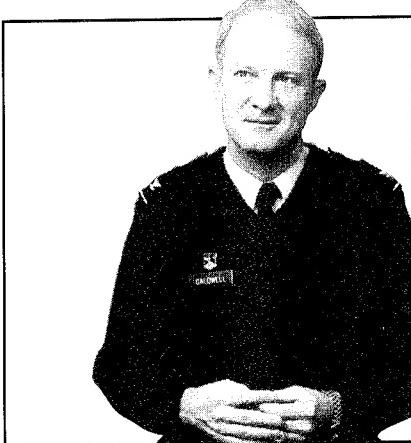
Program Manager (ISSN 0199-7114) is published bimonthly by the Defense Systems Management College Press.

POSTMASTER: Send address changes to:
DEFENSE SYSTEMS MANAGEMENT COLLEGE
ATTN: DSMC PRESS
9820 BELVOIR ROAD
SUITE G38
FT BELVOIR VA 22060-5565

To subscribe, government personnel should submit written requests (using their business address) to the above address.

Nongovernment employees and organizations may subscribe at \$11.00 annually through the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Second class postage paid at Fort Belvoir, VA, and at additional entry offices.

Manuscripts, Letters to the Editor, and other correspondence are welcome and should be addressed as above. Inquiries concerning proposed articles may be made by phone at (703) 805-2892/3056 or DSN 655-2892/3056.



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Whenever feminine or masculine nouns or pronouns appear, other than with obvious reference to named individuals, they have been used for literary purposes and are meant in their generic sense.

Form Approved

OMB No. 0704-0168

Program Manager is intended to be a vehicle for the transmission of information on policies, trends, events and current thinking affecting program management and defense systems acquisition.

May-June 1995

Journal

A. FILE AND NUMBER

Program Manager - Journal of the Defense Systems Management College

B. AUTHORS

Numerous Authors

C. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(E)

Defense Systems Management College
ATTN: DSMC Press
9820 Belvoir Road
Suite G38
Fort Belvoir, VA 22060-5565

D. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(E)

Same as 7.



E. SUBJECT TERMS

Program Manager is intended to be a vehicle for the transmission of information on policies, trends, events and current thinking affecting program management and defense systems acquisition.

F. SUBJECT TERMS

Reengineering the Oversight and Review Process for Systems Acquisition; Breaking Down the "Stovepipes"; An Alternative Environmental Strategy; What TQM is Not

G. SECURITY CLASSIFICATION OF REPORT

Unclassified

NSN 7540-01-280-5500

Unclassified

OF THIS PAGE

Unclassified

OF DOCUMENT

Unlimited

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std Z39-18
298-102

H. PERFORMING ORGANIZATION REPORT NUMBER

Accession & For Monitoring	
REPORT NUMBER	
NTIS	CRA&I
DTIC	TAB
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution / _____	
Availability Codes	
Dist	Avail and/or Special
A-1	

I. NUMBER OF PAGES

48
16. PRICE CODE

J. LOCATION OF ABSTRACT

Cover: Col. (P) John S. Caldwell, Jr., USA, spearheads Acquisition Reform team effort. Also, Lt. Col. Dale G. Shrader, USAF, comments on what TQM is Not!

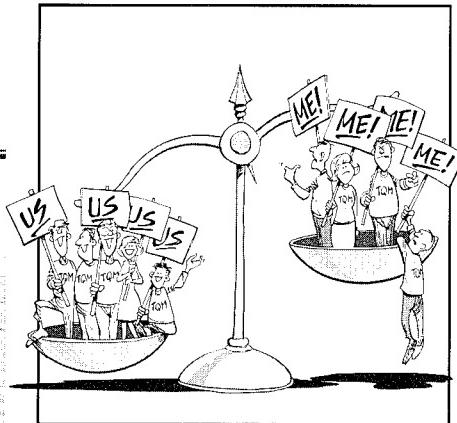


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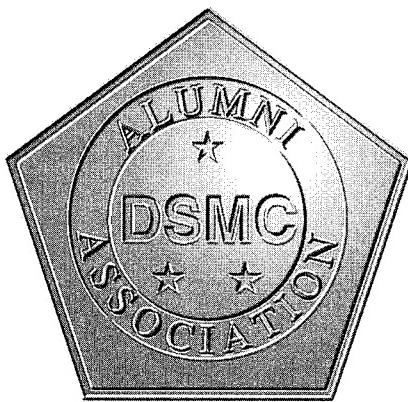


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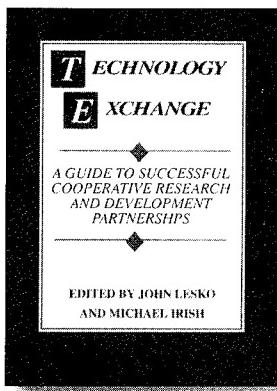


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REENGINEERING THE OVERSIGHT AND REVIEW PROCESS FOR SYSTEMS ACQUISITION

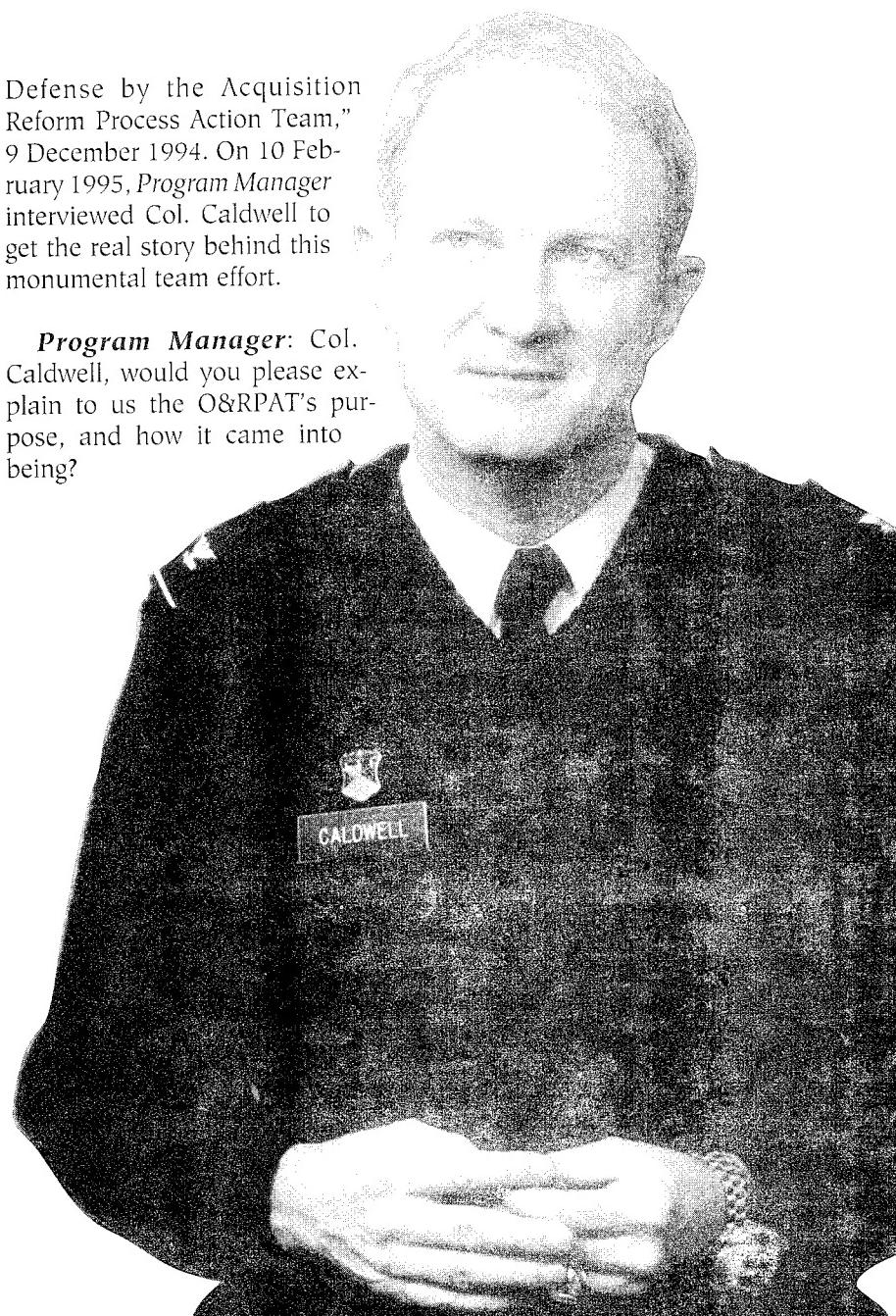
*Col. (P) John S. Caldwell, Jr., USA, Spearheads a Difficult,
Controversial, but Rewarding Team Effort*

From 7 September through 16 December 1994, the Defense Systems Management College (DSMC) hosted the Department of Defense Acquisition Reform Oversight and Review Process Action Team (O&RPAT). Led by Col. (P) John S. Caldwell, Jr., USA, the team was handed a massive assignment by the Secretary of Defense: "...to develop within 90 days a comprehensive plan to reengineer the oversight and review process for systems acquisition, in both the Components and OSD, to make it more effective and efficient, while maintaining an appropriate level of oversight."

Col. Caldwell and his diversified team of acquisition professionals from all the Services set about doing just that. The results — *Reengineering the Acquisition Oversight and Review Process*, "Final Report to the Secretary of

Defense by the Acquisition Reform Process Action Team," 9 December 1994. On 10 February 1995, Program Manager interviewed Col. Caldwell to get the real story behind this monumental team effort.

Program Manager: Col. Caldwell, would you please explain to us the O&RPAT's purpose, and how it came into being?



Col. (P) Caldwell, USA, is the Military Assistant for Systems Acquisition, Deputy Under Secretary of Defense (Acquisition Reform). He is a graduate of PMC 91-1, and previously served as the Abrams Project Manager.

Ms. Collie Johnson, Managing Editor, Program Manager, conducted the interview on behalf of the DSMC Press.

Col. Caldwell: The team was formed to accomplish the tasks in the Charter that Secretary of Defense Perry personally signed. Secretary Perry, in an umbrella document called *Acquisition Reform: A Mandate to Change*, cited various positive attributes of the acquisition process, applauded the people that had been working within that process, acknowledged that we have developed and produced world-class weapons systems, and then concluded we can't afford to do business that way any more.

Dr. Perry chartered the O&RPAT to focus on a specific part of the acquisition process—the oversight and review processes, which in a nutshell comprise the decision making process within systems acquisition. We started with major systems acquisition, then went to lower categories. We were directed by the Secretary to look at the Department of Defense and OSD staff, as well as the Services, as we were reengineering the process.

Mrs. Colleen Preston, the Deputy Under Secretary of Defense (Acquisition Reform) and her staff, through a coordinating mechanism called the Acquisition Reform Senior Steering Group, which meets every 2 weeks to coordinate all acquisition reform issues, solicited team participation from all the Services and OSD staffs. Once we received names, Mrs. Preston, her staff and Dr. Pallas, OUSD(A&T), who was appointed by the Charter to be the team Executive Director, screened the names. We approved the team's membership and convened the team for the first time on 7 September 1994.

Program Manager: Would you tell us how you put the team together and what types of professionals were working the issues?

Col Caldwell: The Services and all the stakeholders that chose to participate submitted names of potential team members. The charter appointed

Dr. Perry chartered the O&RPAT to focus on a specific part of the acquisition process—the oversight and review processes, which in a nutshell comprise the decision making process within systems acquisition.

through what we knew would be very tough sessions on these issues. Quite frankly, people came in from their organizations professing to want change, but probably wanting to change things other people did, not what they did. We knew we would have to work through that. In hindsight, we probably could have done a better job by selecting only people committed to broad-based, substantive change. I do think we eventually overcame this shortcoming.

The variety of people was very good; the experience of people was very good. I think there was a balance of people that spent much of their time in program offices as well as those people with a predominant staff orientation. There were probably some weak areas we could have done a better job of filling—but our open and collaborative idea development process overcame this weakness.

We did have a broad spectrum of talent. There were people who had experience in a joint arena. There were people from all the Services except the Marine Corps. While the Joint Staff did not have a member on the team, we had active Joint Staff support, so the team credentials were very good. We supplemented those by knowing where to go for reference material. The acquisition process has been studied by many prestigious groups with substantial credentials in industry as well as government. There was no shortage of studies!

Based on our Charter, we were able to invite almost any high-level executive in any of the Services and agencies that we needed to come out to speak to us and discuss their views. Many provided frank and candid input. We had several who spent more than one session with us. These executives also were able to solicit input and comments from the people they supervise in this process. So we had a wide array of talent on the team. We gained a wider, deeper and more senior array of talent, advice and input



Photos by Richard Mattox

Col. Jeanne C. Sutton, USAF, reviews the final draft of "Reengineering the Acquisition Oversight and Review Process" with fellow process action team member, Terry R. Little.

from outside the team as we developed our report and recommendations.

Our job was to meld all of that together and to fulfill the Secretary's charge to reengineer the process, meaning *radically change it*, but in such a fashion that the recommendations could be implemented. We knew that would be a real trick. One of my objectives as the team leader was to create an environment for frank discussion of all issues, yet produce a report where all members of the team agreed with all recommendations on all issues. We achieved a consensus report, which was just one person short of unanimous on one issue. There were some small wording issues that not everybody totally agreed with, but they were not of sufficient magnitude to be considered disagreement with the recommendations.

Program Manager: You stated that producing the O&RPAT report was a difficult task. Would you tell us how difficult?

Col Caldwell: Yes, and it is really a take-off on some of the things I've already touched upon. I think we planned our process pretty well, and we worked that plan out with Mrs.

Preston early; got her approval of the schedule and the general way that the Process Action Team's business was going to be conducted, including the front-end team building. But I think all of us — I know in my case — probably underestimated just how difficult it would be to bring all the various interests together.

But I think we did that well, and the acid test was when we sent out our 30-day interim report required by our charter. We discussed and weighed the pros and cons of what that report would contain, and I made the decision that the best approach was to distribute a complete array of ideas that we were developing and generating within the group, but without recommendations. In that interim report we also gave a fairly frank assessment of the state of the practice today.

We intended that report to be a constructive launch pad, consistent with Secretary Perry's assessment of the state of the practice, as outlined in his document, *Acquisition Reform: A Mandate to Change*. However, many people reacted in some ways that were not constructive to the effort; and I believe as a result of that, the members of the team felt a lot of pressure, adding to the natural pres-

sures they were already experiencing. So we had to work through that. In the end, I believe getting through that stressful time was a strength. We had initially talked a great deal about how difficult this task was going to be, and I don't believe people realized the magnitude of difficulty until that interim report went out and the reactions followed.

The outside reaction to that report yielded a real surprise to me and the team. There was significant disagreement with the substance of the charter — yet it had been "coordinated" through the Acquisition Reform Senior Steering Group and the Service Acquisition Executives during the summer. We were not able to completely overcome this disagreement with key aspects of the charter.

We continued to work on the ideas, not only the ideas generated within the O&RPAT, but the ideas that were spawned as a result of the written comments to our interim report. We also continued to bring in Service Acquisition Executives, many of the PEOs, and others within the OSD staff. Then we sent out the 60-day report called for in the charter. In this report, we had narrowed the range of ideas and we began to make recommendations — although certainly not a complete set of recommendations. All this time we were trying to faithfully abide by the charter that said marginal adjustments are not going to be sufficient — that we needed to reengineer the process which, once again, means radical change. And radical change is a very slow process in a big bureaucracy, even when everyone is enthusiastically committed to it.

As a footnote, we also traveled to one defense contractor who was trying to undergo substantial reengineering, and the employees were running into some of the same problems, even though they had strong top-down guidance and active personal participation by the senior ex-

ecutives. Yet a few months into their process (by the way, they had taken more than a year to get to about the stage we were in about 2 months), they came to the conclusion that they could not reengineer themselves. So they had to hire outside, high-powered consultants to help facilitate their reengineering. We didn't do that, and that added to the difficulty of the process.

But in the end, as is often the case when you do team building under stress, the pressure welds the team members together and ultimately produces a better product if you stick with it.

Another key factor is momentum. Secretary Perry gave us 90 days in the charter to do this. There was apparently not agreement in the oversight community that 90 days was an appropriate length of time to accomplish our tasks. Nevertheless, I was assigned the responsibility for getting the tasks done in 90 days, and I believed that we had the capability to do it.

The momentum and speed at which we were accomplishing our tasks caused a lot of discomfort with the process, not only outside the team but inside the team. In some ways, I also believe it may have caused a kind of crisis in confidence within the team, even though we had very skilled people across an array of specialties. In my view, it took about 60 days of work as individuals and as a team before we fully believed we could do what our charter outlined for us. In the end, I believe the team felt it put together a comprehensive report that fulfilled the Secretary's charter.

It was harder than I thought it would be, but it was gratifying to put together such a comprehensive report. We are getting a lot of reaction in support of most of the recommendations, but there is some opposition to most of the recommendations. On balance, the general reaction is positive on the quality of the report and

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the substance of the recommendations. But the fact that the report has generated dialogue is positive in itself and reaffirms that we as a team did what we were told to do. We didn't, in some cases, make radical enough recommendations. In some cases we made, even though they were subtle, recommendations that would make substantial change in the way we do business — and I think, substantial improvement.

Program Manager: When you were preparing this report, what were your goals?

Col. Caldwell: Besides the goals and the tasks laid out in the charter, we as a team discussed and came to an agreement on the state of the current practice of the oversight and review process within the whole acquisition process. As we built our vision of where we wanted this process to be when recommendations would be implemented, we developed goals.

These comprehensive goals are very much customer-oriented, which we think in itself represents a change in the way this process is currently oriented. We substantially discussed, debated and evolved these goals early in the process. As we went through the process and developed recom-

mendations and implementation plans, we continually rated our work against these goals and our vision.

So we, as a team, felt very solidly and very strongly that our recommendations as a comprehensive set of plans met the goals we established and agreed to uphold.

Program Manager: What are some of the major recommendations made by the O&RPAT team?

Altogether, the team made 33 recommendations to reengineer the process. Of those 33 recommendations, which are fully discussed in Volume II of our report, let me highlight the major ones:

- **Forge a Three-Milestone Process.** To make the process more efficient, our reengineered process has three major milestone decisions,

GOALS

- Help field what the warfighter needs when he needs it.
- Demand accountability by matching managerial authority with responsibility.
- Promote flexibility and encourage innovation based on mutual trust, risk management and program performance.
- Foster constant teamwork among everyone who is a stakeholder.
- Actively promote program stability.
- Balance the value of oversight and review with its costs.
- Emulate the best practices of successful commercial companies and successful government ventures.
- Preserve the public trust.

while maintaining other critical decisions.

- *Trim Milestone Decision Documents and Activities.* There needs to be a dramatic decrease in the number of documents and activities required for a Milestone decision.
- *Collapse the Number of Formal Pre-Milestone Meetings to One.* We concluded that numerous sequential Component- and OSD-level meetings and reviews before a Milestone decision meeting are unnecessary activities.
- *Institutionalize Integrated Product Teams to Perform Oversight.* The

Those Programs Requiring Substantial Inter-Service Harmonizing. To be more efficient the reengineered process must abolish the convoluted hodge-podge of mechanisms and activities structured over time to try to harmonize joint program execution, budgets and oversight.

- *Establish More Stringent Experience Criteria for ACAT I Program Managers and Deputy Program Managers.* This will significantly improve the quality of major defense acquisition program execution, facilitate enhanced trust between the Program Manager and the Milestone Decision Authority, and minimize the requirement for independent

program control tool would eliminate the need for other documents and “contracts” (e.g., exit criteria) among the program manager, the user and the Milestone Decision Authority (MDA).

- *Institutionalize a Summit Process for ACAT I Programs.* This will highlight opportunities for cost, schedule and performance trade-offs.
- *Apply Reengineering Principles to Contractor Oversight.* In view of continuing acquisition workforce reductions, the report provides specific recommendations on selecting high performance contractors and adopting commercial oversight practices.

OUR VISION

To have a modernized oversight and review process, hard-linked to the national military strategy, responsive to the priorities of the warfighting Commanders-in-Chief, sensitive to costs, and characterized by mutual trust, flexibility, teamwork and common sense.

model abolishes the notion that advice to the decision maker should be functionally focused.

- *Align Program Accountability and Reporting.* We believe that adopting a short and clear reporting chain for all defense programs would be a major step toward making the oversight process more efficient and effective.
 - *Centralize the Affordability Decision by Placing it Into the Warfighters’ Hands.* We concluded that making the process more efficient demands that deciding whether or not a program is affordable should be within the warfighters’ domain.
 - *Consolidate the Oversight and Review Process for Joint Programs and*
- program assessments by the Milestone Decision Authority oversight and review staff.
- *Stabilize Major Defense Acquisition Program Manager Tenure from Program Initiation until Start of Production.* Such stabilization is needed to provide more consistent long-term management of major programs.
 - *Establish a Career Civilian Deputy for the Defense Acquisition Executive and Each Component Acquisition Executive.* These positions would provide much-needed continuity at these senior levels of the acquisition process.
 - *Revitalize the Acquisition Program Baseline.* Revitalizing the Acquisition Program Baseline as the major

Program Manager: Concerning Department of Defense Instruction 5000.2, which describes the current acquisition milestone review process, do the team’s recommendations include changing the milestone process and, if so, are they major changes?

Col. Caldwell: The answer is yes. We do make a recommendation in our report to change the milestone process. In some ways we don’t radically change it, but we emphasize and better define three milestones. Therefore, it is often referred to in the report and in the comments to the report as a three-milestone process. We specified which decisions need to be elevated to the highest level, and which decisions can be delegated downward with little risk.

Our thrust in the report is to push decisions and execution down to the lowest appropriate authority. In our look at the milestone process, we studied, analyzed and debated, looked at the pros and cons, and we decided there are three review milestones that need to be elevated deliberately for decisions by a specific Milestone Decision Authority (MDA). I think our discussion of that represents a philosophy that is different from the current 5000-series instruction.

We also spent considerable time examining the front end of the process. We called that Milestone A, Need Validation. Milestone A — analogous to Milestone 0 in the current process — is not an acquisition decision; we believe it is a *requirements* decision. It follows logically that the Milestone A decision maker should be the user since the requirement or operational need is in his or her province.

The phase between that Milestone and Milestone B is called Program Initiation. It represents a significant change to the current process. We believe the decision to initiate an acquisition program is the **most critical part of the acquisition process**. Based on past history, it represents a near-irrevocable commitment to the program. Central to the decision for a new major acquisition program is the notion that the decision should reflect the entire DoD's commitment — not just the commitment of a Component, the acquisition community or the user. Also, the commitment must recognize and realistically accommodate the long-term cost implications of choosing to start an acquisition program.

Also, we articulated and recommended change to which information needs to be provided at milestone reviews and the associated documentation. We specified who is responsible for providing advice to the MDA in a particular subject area.

We looked at a wide array of people and agencies and spent a lot of time on what information was available. I think our articulation of who should provide information and recommendations to the MDA added clarity and discipline and also challenged the conventional way of providing some of that information. For example, at each milestone we charged the user representative (at the highest level the user representative would be the Vice Chairman of the Joint Chiefs of Staff) with providing the affordability recommendation to the MDA.

The first point I want to make about oversight is that the objective of the team was to have better oversight, not necessarily less oversight.

Program Manager: You've spoken at length about the review [milestone] process; could you tell us about the O&RPAT's recommendations regarding the oversight process?

Col. Caldwell: The first point I want to make about oversight is that the objective of the team was to have better oversight, not necessarily less oversight. We found in our discussions that people tended to equate, as we put it, the number of "eyeballs" in the process to the quality of oversight. We rejected that notion. Oversight is inextricably linked to the review process, and of the two, actually the more important. There are clearly certain times where the decision makers will want to review a program and make specific decisions. However, the bulk of program time is spent in oversight. The oversight process deals more with how to continuously monitor and evaluate a program between decision points.

When we defined it that way, we began to concentrate on who should be doing the oversight and what information was needed to do appropriate oversight. Remember, the Secretary of Defense stated in the Charter that we must maintain appropriate oversight. It became very clear to the team that we currently have a labor-intensive, outmoded (and definitely not an information age-based) oversight pro-

cess, and our recommendations try to address making that process nearly continuous and more modern. The report elaborates on generating information and the flow of that information to all the key nodes in the process, and making that information available to any oversight staffs and all the decision makers.

An important part of modernizing that oversight process requires eliminating much of the documentation that currently exists. We examined that thoroughly and made recommendations that eliminate or recategorize much of the documentation that exists. A lot of current documentation is mandated by statute and we, for the purposes of this Process Action Team, did not try to change statutes because that would be a long process. Instead, we focused on changes that could be made quickly that would give relief to the operators in the system, while maintaining an appropriate information flow.

Program Manager: How did your recommendations treat the subject of Acquisition Program Baseline (APB) breaches?

Col. Caldwell: Our conclusion on the APB is that it needs reinvigorated and reemphasized. We examined the baseline and it became the subject of one of our "stretch goals."

The Process Action Team agreed that the APB should be the primary contract between the corporate decision making structure within the Department, the program manager and the user. It represents a corporate commitment to the structure of the program and the key milestones and gates the program must hit. That would be the primary way that the Department — not only the program managers, but the corporate decision makers — would be measured. Today, the baseline does not have that emphasis, even though it is the way the program manager is measured. We do not believe that the corporate struc-

ture is measured against that baseline. We believe that must change.

We examined the breach status of our programs across the Department relative to their baseline. We concluded that too many (about 40 percent of ACAT ID) programs are in breach at any one time, for various reasons, and we set a stretch goal of bringing that percentage of programs that are in breach way down. We believe that the Department should be measured against this target. That was the capstone "stretch" goal.

Program Manager: What do your recommendations include to reduce cycle time?

Col. Caldwell: That's the second "stretch" goal we laid out in our report. After considerable discussion, we incorporated an idea from a memorandum that the Secretary of Defense signed prior to the Process Action Team, directing the Department and the Services to reduce cycle time by 50 percent.

We put a timeline on that of within 5 years, and throughout our report in the discussion of the milestone process, we began to specify things that will help in the definition of cycle time, and exactly how long a cycle is that we're going to reduce. We believed cycle time reduction was a good

goal to incorporate, and we think it's something that the corporate body, not just the program manager, can be measured against.

Program Manager: Would you tell us what part industry plays in your recommendations?

Col. Caldwell: Indirectly, industry did play a role in our recommendations. One of the strengths of holding our Process Action Team meetings at DSMC was we could rely on the same resources the DSMC staff and faculty enjoy. Their tentacles reach into an industry network. We leveraged off that. We had some staff and faculty present industry views; we had our early reports distributed to DSMC people that interface with the industry groups. And when we got their responses, they often commented from an industry perspective.

One of the references we relied on quite heavily was a report that was done by Dr. J. Ronald Fox.* This study was ongoing before our team convened, but it was concluding simultaneously with the formulation of our report. We used some of his conclusions and data. His report addressed project management from the industry as well as the government point of view. So it was very helpful, even though we may not have agreed with a lot of the report's conclusions.

There was another way that we got an industry view. We traveled to one contractor that I had worked with when I was a project manager, and received a thorough briefing on their reengineering effort. Additionally, there's a lot of available literature about reengineering corporations. We read those documents. We had people go out and research and report on the findings of those studies. So I think we had a pretty good industry view.

Various drafts and the final report were widely distributed for comment as part of the agreed-to process of developing the report. We've had vari-

ous people comment on the quality of our report. For the most part, industry sees our recommendations as reducing their costs of doing business with the government. So they generally are enthusiastic about seeing these recommendations implemented.

Program Manager: How do you propose to measure the success of your reengineered oversight and review process?

Col. Caldwell: This is a difficult area. First of all, we very thoroughly discussed and acknowledged that one can come up with all kinds of metrics, spend a lot of time measuring a lot of things, and still not accomplish much except measuring. We attempted to be very careful and very thoughtful, about anything we measured with the idea that we did not want to sub-optimize some process by causing it to be measured. We wanted to measure macro things because the oversight and review processes are macro processes.

We found no work within DoD that could help us measure the effectiveness of these changes. So measures were very difficult to develop. We didn't come to agreement on measures until near the end. Our measures are reflected in our "stretch" goals. We believe that all of those are measurable. Our implementation plan appoints people to be responsible for baselining these measures. They are all very macro-type criteria that would not sub-optimize any one particular function.

To supplement these measures, we also recommended leadership develop and conduct customer surveys to gauge the effectiveness of the changes based on the recommendations implemented, and to measure progress and satisfaction. Whether the survey is a precise measure will have to be worked out. But certainly it should provide program offices and various oversight organizations and staffs with a mechanism for feedback to the Service and Defense

STRETCH GOALS

- Reduce the percentage of programs with Acquisition Program Baseline breaches to no more than 5 percent.
- Reduce cycle time by 50 percent.
- Reduce the number of people in the acquisition oversight and review process by 50 percent; and
- Reduce the average cost of a milestone review by 50 percent.

Acquisition Executives to tell them what's working, what's not, and why.

Program Manager: Please describe the type of reaction you received to the O&RPAT's report.

Col. Caldwell: We have had substantial reaction to the report. That's what we wanted. We also wanted substantial reaction as we were building and developing the recommendations. Personally, I was worried that the team's tendency would be to take the easy way out and to make recommendations that would be only minor changes. The reason that would be the easy way is because when you try to coordinate any kind of paper, you often reach the lowest common denominator. In this case, that would be one that didn't change much. So reaction would be relatively lukewarm at best, and from low-level staff action officers.

At the same time, you want to consider everyone's view, because the team didn't possess all the knowledge, and in some cases we were wrong. Our facts and our perception of facts were corrected as we developed our ideas. So we wanted strong reaction. Of course it always makes you feel better if you get a lot of support rather than criticism. But most of all, you want constructive criticism of your ideas. And so, our 30-day interim report was especially structured to draw reaction. And we got it! And I think we used it to our advantage and it paid off in the end.

As we developed the 60-day report, the same thing occurred. As the recommendations began to take form, the issues began to crystalize. I don't believe they would have if we had not put some of our extreme ideas out for comment earlier. I think maybe the system would have gone to sleep, and we would not have gotten full participation at a high level.

Oftentimes when you work an issue in the Pentagon, it will be worked at a very low level unless the issue is

Oftentimes when you work an issue in the Pentagon, it will be worked at a very low level unless the issue is one that everyone recognizes is substantial and needs to be elevated.

one that everyone recognizes is substantial and needs to be elevated. Most people recognized these issues needed to be elevated very quickly. And that, along with the fact that Secretary Perry signed the charter, got high-level input early. So whether it was supportive or constructive opposition, it helped our recommendations become better.

It's really not so important that any one group agree with any specific recommendation. The important part was the process had high-level attention and high-level input so we could combine that with the expertise on the O&RPAT. And I'm very confident we had the skill and professionalism to weigh all of the input and make a coherent set of recommendations, even though there are still some agencies that don't agree with some of the recommendations. There's at least one group that doesn't agree with any of them!

Program Manager: Do you believe the team's recommendations will be adopted and implemented? And if so, how soon?

Col. Caldwell: I believe many of the team's recommendations will be adopted, even though some of them may be modified. I believe the pro-

cess is in place to put the report in front of the decision makers. The primary decision maker is going to be Dr. Kaminski, the Under Secretary of Defense (Acquisition and Technology), and the Service Acquisition Executives, acting for Dr. Perry.

Implementation will be the key to reengineering the process now that we have put forth the set of recommendations. The stakeholders are going to present their positions on our recommendations to Dr. Kaminski and the Service Acquisition Executives. They will make the right decision about which recommendations to implement, and which ones not to implement. There may be issues that they just need to study more, because some are very big. No matter what their decisions are, the key will be the mechanism and the process for implementing those approved recommendations. In fact, the O&RPAT spent a considerable amount of time discussing the process for implementation.

I spoke earlier about other studies of the acquisition process — by talented, high-level people. The problem has been that their ideas have not been fully implemented. One of our overriding concerns as a team — not just mine as the team leader — was that we would put forth these recommendations but inadequate implementation procedures would be put in place to see these things through. So we made a very strong recommendation about how to do that.

By early March it will have been 90 days since the team published its report. This delay threatens to dissipate the momentum that was present in the 90-day effort to formulate the recommendations in the first place. The team believes that momentum is a major factor facilitating the needed change, and several team members have contacted me to express concern from the field that momentum will be lost if we don't implement soon.

Program Manager: What do you think of facilities at the Defense Systems Management College for hosting team efforts such as O&RPAT?

Col. Caldwell: I'm happy to answer that. During the process, it became very clear to me that Mrs. Preston had made the right decision to put the team here. First, the accommodations are somewhat isolated from the Pentagon, which for me is more conducive to uninterrupted thought. Additionally, we were relatively isolated so we could shout at each other when we needed to shout at each other, without interrupting other activities.

The resource I mentioned earlier, being able to plug into the staff and faculty whose tentacles reached out into other resources, was very valuable. It would have been much more difficult and much more time consuming to gather that information from another location. Not the least of the conveniences was the structure of the support group. When we needed something, the staff, starting with General Bolton, all the way down through Colonel Knight and others, got us what we needed. We could print the reports, and we killed a lot of trees during the process; we were able to get editorial support; we were able to get anything we needed on short notice. I wrote Mrs. Preston and General Bolton a letter expressing my agreement that they had made a proper decision about doing that; and expressing the team's thanks, as it would have been very difficult to do this job in that time frame without the very direct and very close support that DSMC provided.

We also had extraordinary active support in many different forms from each of the Service Acquisition Executives. Without that support, we would not have the wide array of views on all these issues. In addition, they personally interacted with the team more than once in each case, sometimes in many cases, through

phone calls and visits to a large number of members of the Process Action Team or individuals going back on specific issues.

Others gave a lot of support and we recognized them in our report. Also, Dr. Kaminski was confirmed about a month into this process. On several occasions, the team met with him and got direct guidance and feedback. He also established a direct link with me as the team leader to facilitate access when I needed it. That also added to our capability to complete our task on schedule.

Program Manager: We understand you're going to pin on the rank of a brigadier general soon. Can you give us an idea of what's in store for you, and do you expect to stay in the acquisition arena?

Col. Caldwell: Yes, I plan to pin on the rank in April. I've been waiting for awhile. I do not know what my assignment is. I do expect to stay in the acquisition business. The Army has worked very hard to put the right people in the acquisition corps, and to get the right people to lead the acquisition corps.

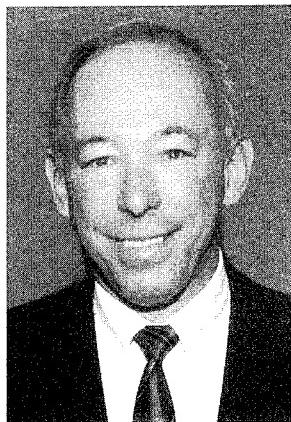
I was fortunate to be selected, and my recent acquisition experience as the Abrams Project Manager probably helped. I don't know the specific assignment that's upcoming or my assignments in the future. I expect the Army will want to get the best use out of me in the acquisition arena. However, one can always be surprised!

Reference

*Fox, Dr. J. Ronald, Defense Systems Management College (DSMC) Study, "The Defense Acquisition Culture: Government and Industry Views from the Trenches" (DSMC Executive Institute, December 1994), p. 27.

Editor's Note: Col. Caldwell is now a Brigadier General, U.S. Army.

Inside D S M C



The Defense Systems Management College (DSMC) welcomed James Wittmeyer as the new Editor, *Acquisition Review Quarterly*, DSMC Press, effective 2 April 1995. Prior to his DSMC assignment, Jim served as Editor of the Pentagon *Early Bird* since 1993. During his diversified career, he also worked as a public affairs specialist for Headquarters, U.S. Army Materiel Command; Headquarters, U.S. Army-Pacific; and other military commands throughout the United States and overseas. Jim's career highlights included editing two award-winning military newspapers, for which he received a Department of Defense Journalism Award (1971), and a Department of Army Journalism Award (1976). A combat veteran, he served as a U.S. Marine Corps rifleman in the Republic of Vietnam, 1967-68.

FROM OUR READERS

LETTER TO THE EDITOR

The article, "Is Fly Before You Buy Obsolete?" by Rear Adm. John J. Zerr and Lt. Mike Oldenburg in the *Program Manager*, January-February, 1995, reinforces my recommendation that the Navy Strategic Systems Programs (SSP) be used as an internship institution for prospective DoD program managers. (See *Program Manager*, "Department of the Navy Strategic Systems Programs Office," January-February 1994.)

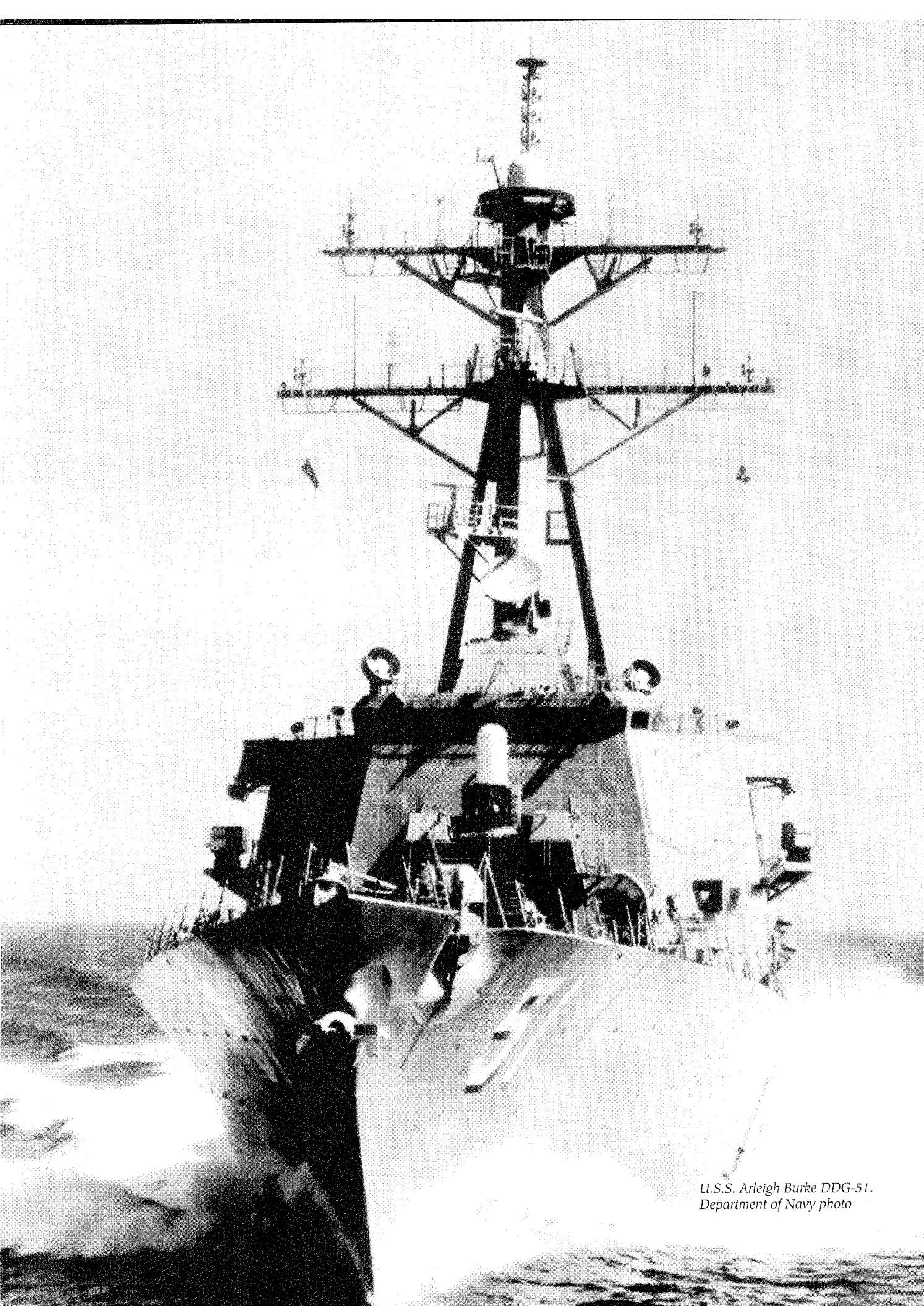
Every one of the areas of DoD acquisition disciplining strategy recommended by Admiral Zerr and Lt. Oldenburg to be acknowledged, has been in action and implemented by SSP since its formation in 1957. The authors mentioned "TWO PROCESSES THAT DO WORK." The first is the software development process in effect at the Weapon System Activities, and the second is the UNISYS model for requirement-setting. The first process is called the Software Development Center (SDC) and the Program Checkout Facility (PCF) at every Strategic Weapons System (SWS) subsystem contractor's plant. The second process (requirement-setting model) was developed by SSP and has been used by all the SWS subsystem contractors, including UNISYS. UNISYS is the successor company to SPERRY, the original Navigation subsystem contractor for the SWS.

Ibrahim A. Ashie
System Engineer
Strategic Systems Programs
Department of the Navy

I read with great interest your article in the Mar-Apr 95 issue of *Program Manager* on the commercial use of satellite imagery. As the debate rages on and both sides make their positions known, I thought your readers would be interested to know that the Air Force is in the final stages of a very successful Office of the Secretary of Defense-sponsored Foreign Comparative Test of a mobile ground station known as "Eagle Vision." This system, developed by an austere Integrated Product Team here at the Electronic Systems Center, Hanscom AFB, receives commercial imagery directly from the French "Systeme Pour L'Observation de la Terreö" (SPOT) satellite. From its test location at Ramstein Air Base, Germany, it regularly processes broad-area imagery into products that support aviation mission planners, topographic units and intelligence analysts.

The major segments of the Eagle Vision system are the Data Acquisition Segment (DAS), which directly receives and processes the SPOT imagery; and the Data Integration Segment (DIS), which merges the individual SPOT scenes into a seamless broad-area picture for use in mission planning systems such as Mission Support System II and the Air Force Mission Support System. The DAS was built by Matra CAP Systemes in France, and the DIS was built by the Environmental Research Institute of Michigan in the United States. The entire system was built and delivered to the U.S. Air Forces in Europe for testing in under 18 months, and has shortened the timeline for processing SPOT imagery from upwards of months during Desert Storm, to as little as a few days.

Lt. Col. Mike Fesko, USAF
Electronic Systems Center
Hanscom AFB, MA



U.S.S. Arleigh Burke DDG-51.
Department of Navy photo

BREAKING DOWN THE “STOVEPIPES”

Information Technology's Role in Solving the Navy's Logistics Support Challenge

Cmdr. Russell G. Acree, Jr., USN • William H. Money

For many years, the United States Navy, like many other large public and private organizations, has attempted to implement large-scale organization changes. Among the changes attempted are significant efforts to maintain, synchronize and integrate access to databases that are geographically widely distributed and administered, and supported by separate functional command and decision making structures.

Background

The Surface Navy's change efforts have been underway since the mid-1980s. At the climax of what was then called the “Revolution at Sea,” Vice Adm. Joseph Metcalf, a former Deputy

Chief of Naval Operations for Surface Warfare (OP-03), proclaimed this goal with dramatic overtones:

Lead, follow, or get out of the way. This is not a job just for the Admirals. This revolution is an all-hands working party, committed for the long-pull.

His was a quest born of personal conviction and vision that only by radical and comprehensive reassessments of roles, missions, systems, technologies and operational practices, and addressing numerous “religious issues” that worked to impede clarity of thought, purpose and action, could the Navy's surface combatants of the future place maximum ordnance on target.

Organizational limitations and delays in developing software tools, control processes and communication methodologies for indexing, accessing, updating and sharing data across remotely distributed databases prevented the computer from becoming an important (if not critical) ingredient in this process. Since the publication of the Navy-Marine Corps white paper, *From the Sea*, in early fall 1992, the Navy labored to make ready for the 21st Century.

The Department of the Navy is addressing strategy, policy, doctrine,

force structure, operations, tactics, shore-side infrastructure, and a myriad of other factors from the top-down and bottom-up in what some see as a “no-holds-barred, nothing-is-sacred” assessment. Their ultimate goal is to ensure that requirements and resources are better aligned, and that missions are fulfilled without a return to the “hollow Navy” of the 1970s.

This perspective led the Navy to an understanding that a new set of environmental, technical and organizational pressures made computer support for database integration more important for success, and far more possible and affordable than it was in the past. In addition, new information system technologies, and the availability of new communication management tools improved the ability of organizations to meet the growing demands for database support.

Today's Navy faces an environment that now restricts staffing and distributes among disparate command structures the responsibility for supporting logistics support tasks with data and documentation. Yet, the Navy also demands extremely rapid modifications to logistics support and operations support data. Such modifications can only be realized by integrating new information systems tools with the mechanisms that access and

Cmdr. “Rusty” Acree, USN, is a Professor of Information Systems Education Management, DSMC. He is a career Surface Warfare officer who, while assigned to the staff of the AEGIS Program Manager, developed applications of information technology for managing technical documentation and logistics support data for AEGIS class ships.

Dr. Money is an Associate Professor of Information Systems, George Washington University. His research has focused on information system development tools and methodologies and the impact of workflow systems and Artificial Intelligence on task performance.

update dispersed organizational information systems.

This article describes the design and implementation of a database coordination and integration system for several of the logistics support processes for the Navy's newest surface combatant — the *Arleigh Burke* class guided missile destroyer. This project, one of the remaining vestiges of Vice Adm. Metcalf's vision, is in keeping with the long-term goal of the Navy to do more with less, while not sacrificing the ability of the U.S. Navy to conduct prompt and sustained combat operations at sea anywhere in the world. Most importantly, the technology and capability emerging from the project has the potential to be transitioned to any business process (government or the private sector), thereby capturing the cost savings benefits of fundamental business process reengineering.

An Information Architecture

The Navy is moving toward an organization-wide information architecture, identified with a set of systems and projects to implement mission requirements. This information architecture is composed of shared databases and application systems. Its role is to collect, store and provide access to the Navy's logistics support, training, engineering data and other logistical support data, as required. Databases and shared applications must be designed with common business objectives, and development projects must be implemented using cross functional teams to design the new integrated systems.

One experimental project, linked to the Navy's and the Defense Department's Computer-aided Acquisition and Logistics Support (CALS) effort, is being undertaken by the Navy's AEGIS Program as a method to decrease weapon systems life-cycle costs of the Navy's *Arleigh Burke* (DDG 51) class guided missile destroyers. Embodying the philosophy of "build-a-little, test-a-little, learn-a-

lot," the DDG 51 class Integrated Logistics Support (ILS) Improvement Project responded to Vice Adm. Metcalf's challenge. The Project is now in position, and the Navy expects it to —

- evoke reengineering of fundamental logistics support business processes within the AEGIS Program; and
- be the catalyst for fundamental business process reengineering for the way the Navy manages technical documentation, trains sailors and maintains complex weapons systems in the 21st Century.

The AEGIS Program's *raison d'être* is the design, construction, outfitting and delivery of AEGIS warships to the fleet, and the planning and execution of modernization and lifetime support for those ships, i.e., "total support, from cradle to grave." Indeed, from its inception more than two decades ago, this Surface Navy program always embraced three key commitments:

- to deliver the most modern, affordable, capable and war-ready ships in the world;
- to provide the best and most affordably trained officers and sailors to man those ships; and
- to maintain the readiness and modernization of those ships at the highest possible state throughout their service lives.

Today, 27 *Ticonderoga* class AEGIS guided missile cruisers are in commission. Seven *Arleigh Burke* class AEGIS guided missile destroyers have been delivered, with another 22 either under construction or under contract. A total of 58 destroyers are planned.

Reducing Costs By Recapitalizing the Navy

The system criteria for assessing whether or not logistics support requirements for ship systems and equipment are effectively met for the

cruisers and destroyers have now changed dramatically. But the computer support tools to support systems designed to integrate these requirements have not kept up with the requirements evolution. In addition, the criteria used to assess the effectiveness of meeting requirements shifted in their relative importance. The Navy is now using a new set of criteria that stress effective systems integration as the measure of success for information systems that attempt to address an organization's needs. This article identifies four new criteria: **speed, change distribution, auditability and labor efficiency**.

These new system criteria address several military business problems associated with the limitations of the current Navy stovepipe information systems. First, the Navy must now update its separate logistics support databases in a very short period of time. Therefore, speed is a critical factor in assessing the overall success of a management information system support process. Second, the Navy must ensure that all changes made to the data are completely propagated to the other stovepipe systems (databases). Third, the Navy must audit the common and shared data among the stovepipe systems, and assure that all data are correctly entered, updated and fully synchronized. Finally, the Navy's logistics support methodology must now be executed in accordance with new staffing limitations imposed by Congressionally mandated downsizing.

A critical underlying factor associated with each criterion of the Navy's program to ready the Naval Service for the next millennium is the Navy's requirement to reduce shore-side and other support infrastructure costs. This will allow the Navy to "re-capitalize" itself and maintain a sufficient force structure of trained and motivated people to meet the needs of the future. Additionally, reducing support infrastructure costs will allow "right-sizing" the fleet for the Navy's continu-

ing extensive political-military commitments within the very real and austere fiscal constraints of today.

Reducing the expensive shore-side infrastructure required to support the Burke class destroyer is one objective of the AEGIS Program Manager's DDG 51 ILS Improvement Project. The solution lies in the capability of today's Information Technology (IT) and IT's ability to integrate information horizontally across an organization.

A Growing Navy Logistics Support Challenge

The Navy now faces complex reengineering and process innovation challenges. To solve these challenges, the Navy expects its Navy information systems to meet some or all of the different, and in many cases, heightened criteria previously identified. These new criteria (speed, change distribution, auditability, and labor efficiency) may appear to alter the original system requirements and assessment criteria, which previously emphasized data input, retrieval, processing or calculation, and production functionality for predefined reports as the critical measures of effectiveness.

This change was observed in other information systems environments. For example, Orlikowski¹ cites the rationale for the adoption and use of Computer-Aided Software Engineering (CASE) tools as being in part derived from information systems managers' desire to implement a new methodology and corporate architecture that would facilitate the redesign of business units.

This documented attempt to influence business operations represented a change from previous functions that the information systems group supported in the organization. It is an added requirement (or an additional criteria) that may be used to assess the effectiveness of the information system of the organization studied.

The role of information systems is to implement strategic systems plans, and to collect, store and provide access to all of the organization's data, as required.

To meet this criteria, the organization must no longer attempt to develop stand-alone functional information systems with the support of specific units within the organization.

Orlikowski cites specific examples where organizations now modify their information architecture and implement the organization's requirements and evaluation criteria with new systems and projects. The new information architectures are composed of shared databases and application systems. The role of information systems is to implement strategic systems plans, and to collect, store and provide access to all of the organization's data, as required. Databases and shared applications are funded through common mechanisms, and development projects depend on cross functional teams to implement new integrated systems.²

Today's Navy appears to face a very similar challenge, with a similar solution. The Navy's logistics support environment must incorporate the support data associated with rapid

changes in technologies used on ship's equipment and the fleet's weapons systems. Its support environment must also complete upgrades in support systems, logistics support data, training requirements and technical documentation. These rapid changes can only be realized by using systems tools that are integrated with other organizational support systems.

Navy managers must select a mix of tools and systems to support all of the organizational facets of integration and concentrate on using these tools to coordinate the Navy's diverse logistics tasks. This article describes how the Navy's AEGIS Program is redefining new requirements for logistics support systems and reevaluating criteria. This redefinition of requirements and reevaluation of criteria is intended to emphasize the use of information systems as organizational change tools for executing business process reengineering within the logistics support processes for the Arleigh Burke class destroyers.

DDG 51 Logistics Support Requirements and Evaluation Criteria

The Navy's logistics support information systems are similar to systems found in many of today's corporate organizations. The systems combine many different features such as a Graphic User Interface (GUI) for front-end capture of information with a relational database, mechanisms for file storage and retrieval, and systems management controls using a workflow system. This systems environment is typical of organizations that are experiencing ongoing evolution in their information systems.

In general, these systems must store logistics data and supporting information in an organization memory that can be used within the organization. The organization memory will serve as a design and development data dictionary to support the ability to use the data model as a tool that can be used to demonstrate the char-

acteristics of the business relationships among the business units in the organization. The data model must be compatible with systems design and in implementation to show how departments and units are related to each other.

The tools that support these systems must link to the front-end, PC-based development environment of the organization, prototype- evolving applications, and integrate the various databases of the organization.

The AEGIS Program Manager, in the life-cycle support role for AEGIS class ships, funds the AEGIS Program's share of the Navy's enormous "stovepipe" logistics support organization for logistics support of AEGIS ships. Today, the Navy's logistics support infrastructure consists of separate and distinct organizational processes. In only rare instances (usually a crisis or other emergent situation that forces manual integration) do these processes interact with one another.

The AEGIS Program Manager focused the DDG 51 Logistics Support Improvement Project on horizontally interfacing information across six of the most important logistics processes that promise to return the most for the investment buck. These processes are —

1. *Planned Maintenance System (PMS)*. This system administers and accomplishes preventive maintenance afloat and ashore.
2. *Engineering Change Proposal (ECP) Process*. This is the process that reviews, approves, sequences and schedules proposed engineering changes.
3. *Allowance Parts Lists (APL)*. These are the parts lists every ship maintains, which specify the spare parts and quantities each ship shall carry.
4. *Ship's Manning Documents (SMD)*. These are the documents that describe how a ship shall be manned

in terms of required numbers of crew and their skill levels.

5. *Training*. This process provides for the correct training for ship's crews commensurate with the types of equipment and systems installed aboard the ship.
6. *Technical Manuals*. This process provides for the production and life-cycle maintenance of the Navy's equipment and systems technical manuals/documentation.

Each of these six organizational processes are executed by thousands of Navy uniformed, civilian and contractor support personnel who are widely dispersed geographically throughout the country. These processes are accomplished primarily in a paper environment, and employ "sneaker post" and the U.S. mail for connectivity. For example, it could be possible for a PMS feedback report originated from an Atlantic Fleet AEGIS ship, which recommended a change to an existing maintenance procedure, to pass through as many as three separate shore support organizations — COMNAVSURFLANT in Norfolk, VA; COMNAVSEALANT in Norfolk, VA; and the Philadelphia detachment of the Naval Surface Warfare Center (Carterock Division) — before the change, if approved, is finally disseminated to all AEGIS ships.

Significant problems arise with this process if the new change in maintenance procedures recommended by that Atlantic Fleet ship drive other changes requiring —

1. additional training for maintenance personnel;
2. different spare parts;
3. revisions to a technical manual/operators manual; or
4. a reduction or increase in ship's manning requirements.

It may be many months before all of the changes are entered into "the system" correctly, and much longer before those changes ever reach the

deckplates aboard an AEGIS destroyer.

Major Components of the System

The basic objectives of the DDG 51 program are to use standard IDEF modeling techniques to define the data, processing requirements and workflows of the current logistics support process, i.e., the "as is" process, then, to employ Information Technology to replicate the process. Later, close examination of the "as is" IDEF model allows for calling into question each sub-process to determine its value in accomplishing the overall process. Process reengineering can now begin using information technology to replicate the reengineered workflow processes. If this sounds a lot like Total Quality Leadership/Total Quality Management, it's because that's exactly what is.

The system's current major components are the **product locator**, a **workflow management** system, and the six remotely distributed and maintained **databases**. The system used by the Navy requires a logical organizational data model and a relational database that allow for creative use of the relationships to identify and solve data association logistics support problems. The goal was to use the model to eliminate unsynchronized entries into databases, and to avoid building and storing complex rules that must be memorized and used by employees.

The **product locator** is a crucial portion of the system that provides the logical data model. It serves as the essential database and driver for the coordination of all change drivers, and for locating logistics support equipment data. It contains a data model that stores the data that are used in the stovepipe engineering and documentation system designs, and may contain relationship data that indicate how various documentation and support databases are related to each other. The system is loaded with

data that provide the information and guidance to make integrated and coordinated changes in the —

- Allowance Parts List;
- Technical Manuals; and
- Navy Training Plan and Manning Documents Planned Maintenance System Documentation.

Engineering Change Proposal Process

It is important to understand that the support processes being integrated using this approach are widely dispersed in geographic locations and are disparate in implementing technologies. As an example, the AEGIS Engineering Change Proposal (ECP) Process infrastructure for the Machinery Control System (MCS) aboard the Burke class destroyers is comprised of the prime contractor, Martin Marietta Corporation, Daytona, Fla.; the AEGIS Program's Change Control Board (CCB) in Washington, D.C.; the Naval Sea Systems Command also in Washington, D.C., which is the MCS life-cycle manager; the Philadelphia detachment of the Naval Surface Warfare Center - Carterock Division; the Supervisor of Shipbuilding, Bath, Maine; and the lead shipbuilder of the Burke destroyer, Bath Iron Works in Bath, Maine.

The development of the product locator by the Navy is a strategic step in the implementation of newer information system technologies to overcome the limitations of the organization's old and costly, manual, stovepipe-like environment. The new system is a conscious effort to modify the uncoordinated flow of information for logistics support functions that previously supported the independent processes and sub-processes.

Observations indicate that the stovepipes' support processes were primarily geared for production activities, and were not oriented toward answering management questions, supporting analysis of business information, or assuring that correct and

The benefits from the product locator are particularly important to the Navy in the multiple database access areas.

complete changes had been made to all support documentation in all of the other stovepipe systems for logistics support. The benefits from the product locator are particularly important to the Navy in the multiple database access areas. The current stovepipe processes made it difficult to track multiple sources of logistics support data for one piece of equipment.

Logistics support changes made at different times or with slight variations in the name of the equipment or part modified are not always available for the sailor (and different organizations may have updated the data at different points in time). The impact of this problem is twofold. The sailor is confused, and the Navy must develop further complex training procedures to correctly use its rather unique and uncoordinated stovepipes (a direct cost to the organization).

A common product locator database under development by the AEGIS Program Manager for the logistics support of the *Arleigh Burke* DDG-51 class destroyer solves the problem because a single source can be examined to identify all of the ship's equipment and systems support data storage locations maintained by the Navy. Associations among the

data can be reviewed. The overall result is better logistics support service, reduced training and decreased cost to the Navy.

Workflow Management

Systems design and development literature emphasizes the enormous productivity and potential integration benefits from the increased systems connectivity available in today's information system technologies. These benefits can begin to be tapped using the **workflow management** component of the DDG 51 ILS system when this system is combined with the product locator capability.

The workflow system has the capability of routing images and files throughout the logistics support organization network. It may contain embedded timers to check for the occurrence of an event or action. A file may be created in a special directory, and a process or transfer of data initiated to continue the logistics support processing. This enables the work to be monitored as it passes through the different functional areas. If the files or "folders" are backed up in one area for any reason, the work may be reassigned to another area for completion. The workload balancing enables all of the logistics support update tasks to be effectively sequenced and scheduled.

The workflow system may also be used to establish mailboxes, define processing routines, set timing and triggers for the execution of routines, establish processing diaries, maintain comments, and construct forms for use in systems processing. It has many multi-user capabilities that support the integration required across the different functions performed in the stovepipe systems. This helps to solve the enormous and expensive logistics support challenge that the Navy faces.

In perspective, the Navy is in a crisis as to how to manage all this information. Until now, the Navy was constrained to manage all this logis-

tics support information using paper-oriented, page-based manual processes because the information technology required was either not available or not affordable.

The Chief of Naval Operations (Logistics), for example, estimates that the Navy produces 22.5 million page changes to technical manuals alone per year, using approximately 1,000 sailor man-years of effort per year, and costing the taxpayer approximately \$400 million. For the AEGIS Program Manager, maintaining technical documentation for the sophisticated and highly complex AEGIS Weapon System (AWS) is proportionately just as expensive. The Navy has already begun transitioning AWS technical documentation from paper-based formats to highly interactive, digital format.

Similar problems exist in many other areas, such as the spare parts problem aboard an AEGIS destroyer. An AEGIS destroyer has approximately 23,000 spare part line items, with each item carrying its own distinctive part number. Each line item consists of at least one spare part, and most commonly there may be carried more than 1 unit of the same numbered stock item. In all, an AEGIS destroyer typically carries six times the number of spare part line items or approximately 138,000 spare parts.

To illustrate the enormity of the logistics crisis facing the Navy and all of the Uniformed Services, and to put this crisis in the perspective of simply being an **information management problem**, imagine a "worst-case" scenario where a sailor aboard an Atlantic fleet AEGIS ship identifies an electronic circuit card problem in the ship's MCS. The sailor immediately and correctly submits a feedback report on the problem, as required. For routine, non-safety related feedback reports, it takes a very long time (possibly months) to alert all other ships about the problem, its resolution, and the materials and instructions needed to

fix the problem aboard other AEGIS ships.

In the interim, another sailor aboard an AEGIS ship in the Arabian Sea encounters the same problem. Not knowing his or her manuals and technical documentation are no longer correct, the sailor unwittingly attempts to fix the first problem. Incorrect tests are performed and ultimately, further damage occurs. The sailor attempts to obtain repair circuit cards from supply, but finds that they too are incorrect because the APL (allowance parts list) is outdated. New parts are requested. The correct parts arrive in 2-5 days, but problems still persist in the system, and the outdated technical manuals fail to cover these new problems.

Finally, the ship requests technical assistance. Support personnel (technical assistance team consisting of one or more technicians) are flown from the U.S. to Saudi Arabia and transferred to the ship. Armed with the correct technical information and skills, the technical assistance team quickly restores the MCS to full capability. Although this is a "worst-case" scenario, varying degrees of this scenario are all too common, tremendously expensive, and caused simply by inefficient information management.

The Navy Is Solving An "Academic" Problem

Organization theory literature views the level of integration achieved between the decision makers in an organization or system as a concept representing the "quality of collaboration actually achieved between organizational units."³ The problem solved through integrative organizational efforts is one of recomposing the segmented sub-systems and environments of an organization into a totally managed organization responding to a complete environmental problem, uncertainty or demand. The recombination is necessary for the differentiated components of the

organization, which may have adopted different goals and objectives.

The theory of integration stresses information sharing as one of the important factors that contributes to a high level of integration achieved among the organizational sub-units. The sub-units must have available information and channels to exchange key data needed to solve problems and to perform tasks assigned to each sub-unit. The research of Lorsch and Allen suggested that integration is dependent upon the inter-unit relationships and decision making. How managers exchange information, resolve conflicts, and make joint decisions all influence the level of integration achieved.⁴ March and Simon⁵ viewed the level of integration as "the lowest level at which all activities relating to a particular goal can be coordinated through the formal authority mechanism." The task of integration cannot be placed at a lower level than the interaction between the decision makers in these sub-systems.

This coordination can be seen in the Navy's AEGIS program where the six logistics support processes are coordinated by "administrative levels" within the organization. In the past, this coordination occurred through the imposition of rules, procedures, and behavioral standards that govern the actions of different functional components of the Navy. These interfacing efforts are now being implemented (or imposed) by information systems technology that supports a truly coordinated approach to the solution of Navy logistic support problems.

Plan for the Next Phase

The new system does not differ in data capture, front-end editing and task assignment/oversight when compared to the old paper trail and manual processes. In the present phase, electronically replicating the existing logistics support processes for the DDG 51 MCS is the objective. The benefits

here are derived simply by efficiencies gained with eliminating paper roadblocks and queues, and moving information internally and externally electronically. In this phase, no attempt was made to reengineer existing processes.

The next phase of the project had many options for demonstrating how artificial intelligence (AI) and decision support system (DSS) capabilities can be substituted for some subprocesses now done by people, thereby enabling reductions in support infrastructure and improving overall logistics support. For example, one option was to demonstrate how AI and DSS could improve processing by using a front-end data editing capability. Front loading with an expert system or decision support system to minimize errors in data entered into the system, assign the careful distribution of data among the systems, and to monitor updates to the databases might achieve significant reductions in existing support infrastructure.

Another option considered was to show how a decision support or expert system capability might enable the system to intelligently deal with any future changes that may occur in workflows of the major support processes (i.e., PMS, ECPs, APLs, SMDs, TMs and training). If users modify their tasks, changes could potentially be propagated to the database or the business rules of the organization and eventually support AEGIS reengineering efforts.

The third option (selected for demonstration) was to use an expert system to meet requirements for the storage and implementation of the customized logistics information processing rules of the Navy. These are the rules that select work processing sequences and determine how changes to logistics documentation are maintained. A complete expert system might eventually contain hundreds of business rules for updating

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and handling the enormous amount of logistics documentation, engineering drawings, instructions and technical materials that are currently maintained only in written procedures or in the corporate knowledge of sailors, Navy civilian employees or contractor support personnel. Sometimes, even the rules themselves may be unwritten. It may take months or years to train a sailor, civilian government employee or support contractor to become completely proficient at managing a logistics support task and understanding the rules. Over time, the system could be used as a primary logic editor for the application and will probably increase in size as the ILS systems mature. Data to be included in the system could encompass training information and related data that are stored in job descriptions of the In-Service Engineering Agent (ISEA). These documents could include training manuals, business

rules for each system, written guidelines and procedural manuals.

As an example, the system will seek to demonstrate how it can be used as the business source of the rules that define what the MCS ISEA does to sort and sequence maintenance requests for system technical documentation and manuals when ECP-driven changes are processed. The expert system will demonstrate how it can provide data to the workflow management system, which checks tables to determine which tasks are to be performed next. If a status flag shows that a next task exists, the system will place the logistics support data, images, reports and associated documents in the electronic mailbox of the cognizant individual for further action.

Using this capability, the Navy could significantly increase managerial "what if" capabilities that can be derived from the databases and environmental information available to the maintenance personnel.

Summary

The evolving DDG-51 information systems environment is typical of organizations that are experiencing an ongoing evolution in their information systems, concurrent with changes in the organization. These information systems must now store information in an organization memory that is accessible to all users of the information to serve as a design and development data dictionary; and to support the ability of organization members to utilize the data model as a tool that can be used to characterize the business relationships among the sub-systems in the organization.

This means that the system must be capable of identifying the impact of organizational changes, identifying overlaps and duplication in data, and noting where and how task reengineering might impact operations by examining the business relationships identified through the data

stored in the systems of the organization.

The question of "how" to accomplish this is a primary concern for managers who face unintegrated systems such as many of those in today's government and business environments. Far easier is to describe what has happened in this Navy program and why the change appears to be occurring here, rather than to proactively state how new information systems can be developed and effectively implemented for similar complex environments. For the Navy, the change appears to have been both strategic, incremental and evolutionary.

The implementation of the product locator and its workflow components is being carefully assessed to minimize any negative impact on the DDG-51 project, and to implement a systems strategy to transfer this new technology throughout the AEGIS program. Many factors seem to play a

part in making the success occur. The timing of the change was a clear issue. This may include the business and technical motivation of managers in both the Information Resource Management organization and in the AEGIS Program's functional areas. In addition, the evolution and availability of affordable computer programming tools, including the support tools, GUI front end, database, expert system, business rules, optical scanning and storage capability all appear critically important. For the AEGIS Program, price was also a critical issue. The high cost of mainframe tools would have made the adoption of a mainframe-based CASE system far less advantageous. Managers should continually evaluate the relationships between their Information Systems (IS) and business environment, and develop an ongoing approach to strategic planning that involves comprehensive strategies for adopting CASE and other tools that upgrade IS business and organizational support capabilities.

Ed. Note: This article is the basis for an elective course taught by Cmdr. Acree at DSMC on the role of Information Technology for managing DDG 51 ILS. Cmdr. Acree and Dr. Money presented this information at the Idaho National Engineering Laboratory (INEL) symposium in October 1994.

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DAU TO DIRECT NEW ACQUISITION REFORM COMMUNICATIONS CENTER (ARCC)

In a 27 January 1995 memorandum to all staff and faculty at the Defense Systems Management College (DSMC), Brig. Gen. Edward Hirsch, USA (Ret.), Provost and Deputy Commandant, DSMC, announced the establishment of the Acquisition Reform Communications Center (ARCC). As a result of recommendations made by a Working Group formed at the request of Mrs. Colleen Preston, Deputy Under Secretary of Defense (Acquisition Reform), Dr. Paul Kaminski, Under Secretary of Defense (Acquisition and Technology) approved the immediate establishment of an ARCC, under the direction of the President, Defense Acquisition University (DAU).

The mission of the ARCC is *to provide timely, accurate, consistent, relevant, understandable information about how DoD is changing the way it acquires needed goods and services, so participants and stakeholders can make the best decisions and take the most effective actions.*

The ARCC, under the direction of the President, DAU, will consist of three full-time staff members. These staff members will be augmented and assisted, as required, by PAT members, Service and Agency partners and contractor support.

ARCC Goal

The ARCC's goal is to *change behavior by—*

- communicating a common Acquisition Reform message to the people we need to engage for lasting success;
- ensuring consistency of that message;
- creating synergy in communication efforts;
- promoting a rapid, effective communication process;
- focusing on learning, not broadcasting; and
- promoting use of success stories, lessons learned, incentives and recognition programs.

ARCC Functions

In partnership with the Services, Agencies, Associations, etc., the ARCC functions are to—

- gather information, success stories, lessons learned from Process Action Teams (PAT), Experts, Services, etc.;
- develop messages and instructional materials;
- disseminate messages and materials to deliverers (Services, Agencies, etc.);
- coordinate delivery;
- stimulate use of innovative communication vehicles;
- support new incentive and recognition programs;
- facilitate joint government-industry training;
- define metrics and collect data; and
- provide feedback.



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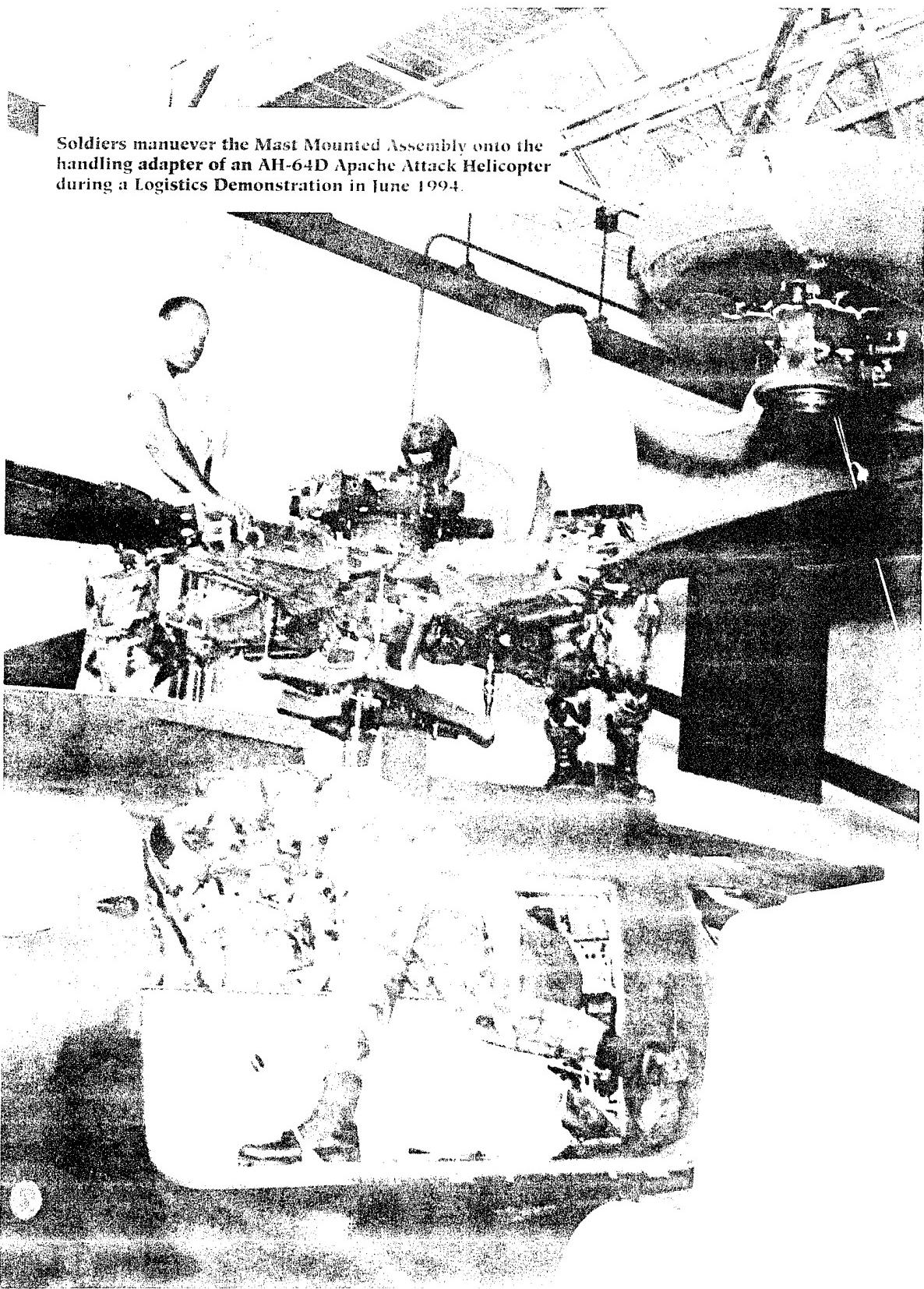
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Soldiers maneuver the Mast Mounted Assembly onto the handling adapter of an AH-64D Apache Attack Helicopter during a Logistics Demonstration in June 1994.

WHEN "UNCOMMON" COMMON SENSE PAYS OFF

Integrating the Logistics Assistance Representative into a Project Management Office

Lt. Col. Thomas W. Light, USA • Elmar Cotti

Most aviation logisticians, at some point in their careers, have probably questioned why obvious problems are not corrected before a system reaches the field. Indeed, probably all logisticians would prefer to correct deficiencies at the source, before symptoms ever appear. Preventing errors from ever reaching the field is precisely the approach the AH-64D Apache Attack Helicopter (AAH) Project Management Office (PMO) is pursuing.

Collocation of Logistics Assistance Representatives

An integral part of this philosophy is the collocation of Logistics Assistance Representatives (LAR) within the PMO during Engineering and Manufacturing Development (EMD). This innovative, proactive and mutually beneficial initiative between the Program Executive Officer-Aviation (PEO-AV) and Aviation and Troop Command (ATCOM) is designed to

reduce our current reliance on Contractor Field Service Representatives (CFSR). On average, the estimated annual cost of a CFSR is \$209,000 versus \$77,000 for a LAR. By breaking the paradigm of "business as usual," we will compress any "CFSR to LAR" transition time on the AH-64D and save the government the cost differential, much earlier than we have on other programs.

In 1991, LAR assignment within PMOs was jointly proposed by the PEO-AV and the Commander, Aviation Systems Command (AVSCOM) — now ATCOM. After a worldwide search for the top candidates, ATCOM assigned two "best-qualified" AH-64A Apache LARs to the AAH PMO in July 1992. The intent was to have experienced maintenance practitioners influence design early in development to prevent errors from ever reaching the field. This would also build the expertise to reduce the use of CFSRs when the AH-64D is fielded.

Longbow — A Complex Weapon System

The AH-64D Longbow Apache is a complex weapon system. Specifically, the AH-64D Longbow Apache Helicopter, the Fire Control Radar (FCR), and the Longbow HELLCIRED Modular Missile System (LBHMMS) comprise the integrated weapon system

designated the Longbow Weapon System (see figure). The Longbow System represents a systematic effort to improve the warfighting capabilities of the AH-64A Apache Helicopter, which was upgraded to yield the AH-64D. Further improvements were made to the AH-64D with the application of the FCR Mission Kit and T700-GE-701C engines. These changes result in a more effective aircraft with increased survivability under current and projected battlefield conditions.

Full-Time vs. Temporary

In 1991, recognizing the complexity of the Longbow System, Maj. Gen. Irby (PEO-AV) and Maj. Gen. Williamson (Commander, AVSCOM) proposed full-time assignment of LARs to the AAH PMO. Currently under the command of Maj. Gen. Cowings, ATCOM recognized its need for full-time versus temporary LAR assignments to fully achieve the intent of the original initiative. Specifically, ATCOM needed significant involvement during EMD for two reasons: to master the intricacies of a new system like the AH-64D with the new FCR; and to obtain the long-term training needed to accomplish the intended goals. Brief periods of assignment would not allow sufficient time for LARs to master the complexities, become totally effective, and participate

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Mr. Cotti is a Logistics Assistance Representative, Aviation and Troop Command, collocated within the AAH PMO in St. Louis, Mo.

bers by participating as part of a total "Team Apache Modernization" effort. This team includes —

- Training and Doctrine Command (TRADOC) user representatives: U.S. Army Aviation Logistics School; U.S. Army Aviation Center (USAAVNC); TRADOC System Manager-Longbow.
- Army Materiel Command materiel developers: ATCOM; Communications and Electronics Command; Missile Command; Armament and Chemical Acquisition Logistics Agency.
- Operational Test and Evaluation Command: Test and Experimentation Command; Operational Evaluation Command.
- Independent Logistian: Army Material Systems Analysis Activity.
- Contractors: McDonnell Douglas Helicopter Systems (MDHS) — AH-64D Aircraft System Integrator; the Joint Venture (JV) between Martin Marietta Technologies, Inc., and Westinghouse Electric Corporation, the makers of the FCR; the JV and Rockwell, Intl., the makers of the missile.

The concept of early design influence is working. The two LARs (Mr. Steve Rutherford and Mr. Elmar Cotti) who were assigned in 1992 rapidly assimilated vast amounts of acquisition, logistics and technical data associated with the AH-64D Longbow Apache. Applying their knowledge of and experience on the current AH-64A Apache (and their personal encounters with known maintenance headaches), they turned to high-payoff areas where their abilities could be tested.

Early in their assignment, they toured the JV's facilities and prepared a trip report suggesting several maintainability improvements for the FCR. The JV adopted many of their ideas over the last 2 years, including a light environmental cover for the Mast Mounted Assembly and the develop-

Photos courtesy McDonnell Douglas



AH-64D Longbow Apache fires a HELLCIFRE missile downrange.

in technical interchange meetings to influence design.

Design Influence

Design influence is not always easy and is usually not achieved by "preaching to the choir." Logisticians in a room talking to one another may be in "sympathetic vibration," but until they get in a room with engineers and "duke it out," design influence will probably not be accomplished. By actively participating with "techies" in their forums and fighting for feedback on suggestions, "loggies" can achieve a subtle but pronounced design influence. Also, LARs bring with them a lot of influence with user representatives, who team up with "loggies" to lean on engineering and management.

LARs — A Brief History

Establishing credibility with any group before an advocate will be heard is essential, but may take considerable time. However, LARs have a unique history that allows them to quickly validate their credibility. First established during the 1940s through Technical Services, the Army hired civilian master mechanics. Once assigned, they assisted organizational units by performing actual aircraft repairs, thereby teaching operational

maintenance and repair procedures to less experienced soldier operators and mechanics. From the 1950s to today, the master mechanics evolved into mechanical or equipment advisors, field maintenance technicians, and finally, LARs. Likewise, their duties evolved from teaching by actually turning wrenches, to teaching new skills, advising in maintenance management and logistics operations, and resolving the ever increasing complex sustainment issues posed by today's technically advanced weapons systems.

In the traditional sense, however, LARs have provided commanders with technical and logistics assistance after weapons systems are fielded. This is an area where PEO-AV and ATCOM are breaking new ground; LARs are becoming involved during the initial stages of design. It certainly makes sense to evoke the LAR's unique readiness perspective early in the development of a system, but *how* and *when* are the materiel developer's challenges.

"Team Apache Modernization"

In the AAH PMO, the LARs have established themselves as exceptionally valuable development team mem-

ment of specific serviceability criteria for FCR components.

They also participated in a major review of AH-64A Engineering Change Proposals (ECP) to help define the input configuration for the modification program. They became totally familiar with the ECPs, which will eventually migrate directly to the AH-64D and, by doing so, were trained on the configuration of the new aircraft. This knowledge is directly applied to current preparation of a Memorandum of Agreement (MOA) and Materiel Fielding Plan (MFP). The MOA defines PMO and unit responsibilities for inducting aircraft for conversion; the MFP defines responsibilities for fielding the AH-64D Longbow Apache.

Technical Manuals — An Important Contribution

The LARs contributed the most in the area of Technical Manuals (TM). Because mechanics must live with TMs every day, over the course of several months, LARs spent time at the manufacturer's plant reviewing draft TMs for use during EMD tests. They pored over the material and insured the manufacturer removed inconsistencies and the books tracked with the technical data they previously reviewed. Since the Longbow program intends to go to Interactive Electronic Technical Manuals, they closely examined the proposed Fault Isolation Procedures. Finally, they drafted a new, scheduled maintenance Phase Book for the AH-64D, incorporating task sequence efficiencies and eliminating duplicate efforts. As this Phase Book continues to be refined and validated, soldiers are simultaneously using it to conduct maintenance inspections on the six prototype aircraft flying in the test program.

Verification of TMs was a key aspect of the Logistics Demonstration (LD) conducted from November 1993 through June 1994. Soldiers performed/verified Longbow-unique tasks using the procedures that the

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LARs had reviewed in depth. The culmination of the LD was the timed conversion of an AH-64D without the FCR mission kit to an AH-64D with the kit installed. This conversion took place on June 17, 1994, at MDHS in Mesa, Arizona, and was performed by a 10-man team of trained soldiers. The conversion took a little over 4 hours, including the Maintenance Test Flight (MTF). The Operational Requirements Document requirement for the conversion is 8 hours.

By far, the bulk of the conversion time involved the removal and installation of the two T700-GE-701 and 701C engines. Standardization of the engine fleet-wide would reduce the time of conversion by more than half and reduce the MTF to a "traffic pattern" flight versus the more extensive engine installation test flight. The length of this recorded time was a direct reflection of the quality of soldiers today, their attention to the training they received, their dedication to the task at hand, and the extraordinary effort of "Team Apache Modernization," including the LARs.

The Payoff

The payoff came in a comment made by a Sergeant First Class at the conclusion of the AH-64D conversion. The soldier stated that he could accept the hard-copy manuals, *immediately*, for EMD tests. Only those who experienced the growing pains associated with the AH-64A manuals can fully appreciate this soldier's statement. He wasn't saying that the TMs were ready to be fielded nor that all the problems had been removed. He was acknowledging the total effort expended to develop thorough and technically correct TMs—as "squeaky clean" as possible for this stage of the program. The LARs played a big part in making this happen.

The same soldiers who participated in the LD participated in Force Development Test and Experimentation from October — November 1994 and Initial Operational Test and Evaluation from January — March 1995. They were supported by Mr. Cotti, who collocated within the PMO in July 1992, and Mr. Jeff Cinader, a recent LAR addition to the program. In this way, they proved the validity of the PEO-AV/ATCOM initiative during operational tests. After operational testing, LARs followed inducted aircraft through the conversion process at the contractor's plant. We plan to train future LARs concurrently with transitioning battalions and to "field" a fully qualified LAR along with converting battalions.

The potential exists for other cooperative programs between PEOs and supporting Major Subordinate Commands (MSC) to solve problems before they occur, or at least before the field has to live with them. This article describes only a piece of the job that still must be accomplished with the other MSCs. The Apache Attack Helicopter PMO is counting on other MSCs to follow suit on this program and, as they recognize the enormous potential, to adopt the initiative in other commodity areas. Why? Because "uncommon" common sense pays off.

WHAT TQM IS NOT

TQM and the Selfless Nature of Quality

Lt. Col. Dale G. Shrader, USAF

As opposed to more traditional writings on Total Quality Management (TQM), which tend to offer laundry lists of what TQM is, the focus of this article will be on what it is *not*. Presuming that you are familiar with the basic concepts and history of TQM, exploring TQM from this opposite aspect becomes more than just an academic exercise. In order to fully appreciate the practical value of a theory, you should examine both the hypothetical argument and its complement.

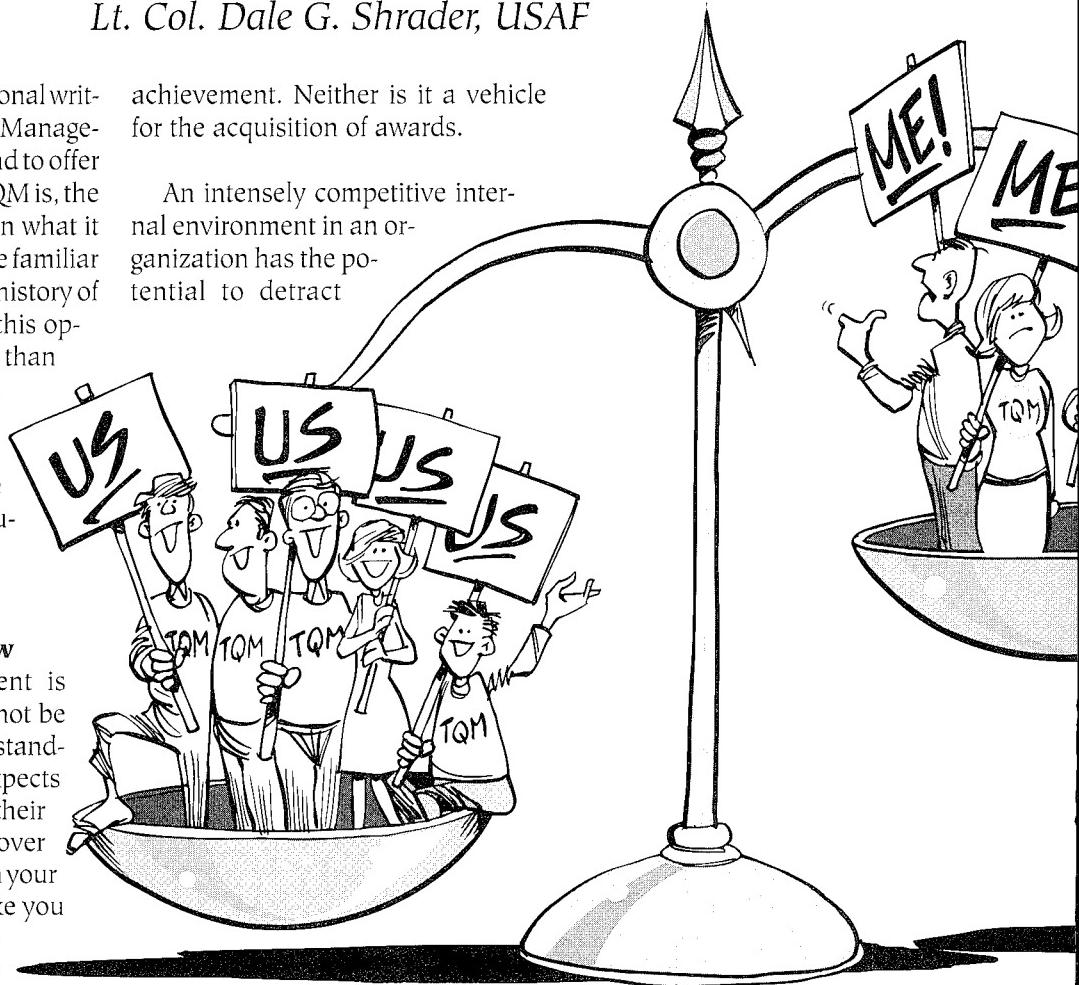
Needs of the Many Must Outweigh the Few

My supposition statement is that... "TQM is not and can not be selfish" — selfish from the standpoint that the individual expects something in return or that their viewpoint or goal wins out over others. Implementing TQM in your organization should not make you famous. If it does, you probably did it wrong. The selfless nature of quality relates

to the premise that the needs of the many must outweigh the needs of the few, or the one. Implementing TQM is not a quick fix to what is ailing at the time. Nor is it something you can do one time and put up on a wall as an

achievement. Neither is it a vehicle for the acquisition of awards.

An intensely competitive internal environment in an organization has the potential to detract



from the very purpose of TQM. Concerning quality awards such as the Malcolm Baldrige National Quality Award, Belden Menkus, an independent systems consultant explains: "There is a real danger we will be thrown off track; this time by awards programs, which place more emphasis on winning than on the process of achieving real quality."¹

The purpose of TQM is not to convince the reluctant or the unwilling of the correctness of its existence. For

this concept to work, you must be willing to admit that your organization or process is in need of improvement. Implementing TQM in an organization is not a survival technique. Nor is it a desperate alternative. Taking this analogy to an extreme, an animal caught in a trap will often chew its own leg off in order to survive. I doubt if anyone would consider this a quality move.

Metrics - A Cornerstone of TQM

One of the major cornerstones of

TQM is that of measurement or metrics. Of the three things managers influence (cost, schedule and performance), quality (also known as performance) is the most difficult to measure with a metric. The purpose of measurement is not to produce wall charts and propaganda, but to provide decision makers with objective evidence of compliance with a predetermined specification or standard. This embraces the ideal of real time in-line process control as opposed to completed product inspection.

However, this is much easier said than done. Most im-

ent environments, TQM has a proven track record of success. But, if not approached with a reasonable degree of enthusiasm, the result can manifest itself in a form exactly opposite to its intended purpose. Very few people I came in contact with were able to give solid answers as to how TQM will improve things in their organization. To many, TQM is a threatening concept. It jeopardizes the status quo and introduces one of the most frightening notions known—that of change. If your organization implemented some form of TQM or is thinking about it, be aware that unrest and discontent are probably the rule rather than the exception.

Concerning the aspect of change, Neil Standal, the Vice President and Assistant General Manager of the Boeing Corporation's 777 project remarked, "It is probably harder to change the way we do business than it is to build the airplane."² It is my observation that, after a modest initial wave of enthusiasm in this country, in some cases, short-sighted management did not see earthshaking results within two or three quarters, so interest in the process began to dwindle.

But why has TQM been so successful in some applications and not in others? Dr. William Edwards Deming, recognized as the father of modern TQM, offers this explanation: "There is no determination to do it. We have no idea what to do and how to do it, what the right thing to do is—we have no goal."³ Perhaps one of the reasons TQM does not succeed might be the view that an organization has of itself.

Struggling for Acceptance

By personal observation and research, I formed an opinion that TQM is struggling for acceptance in many organizations and forums in this country. When presented the concept of TQM for the first time, many people (including myself) are somewhat skeptical (if not outright hostile), and tend

to view it as the "buzz word" of the day. Because TQM may be a vast departure from the normal way of doing business, it appears somewhat disruptive, and people often form the opinion that "this too shall pass." I offer two possible explanations why TQM is viewed from this perspective.

First, TQM is a conceptually slow-moving process. For it to become a part of the culture of your organization, it may realistically take a generation to evolve into the normal way of doing business. The Japanese experience with TQM is the most common one used to depict how this process works. One of the reasons for the success of TQM in Japan lies in the very foundation of the Japanese way of life. That society in Japan exhibits a certain selfless attribute—the greater good of the whole eclipses that of the individual—is well documented. As a matter of historical fact, it took around 10 to 15 years before Japan produced effective evidence as to the success of their TQM approach. Americans, by nature and historical documentation, are a rapid, result-oriented culture. We tend to prematurely abandon efforts if we do not see quick benefits.

Second, the very essence of the American way of doing business presents a major obstacle to the successful implementation of a TQM program. We are not a group-oriented society. The following illustration demonstrates this point. As a matter of reference, this example is a generalization and does not reflect the practices of any one particular organization. It merely serves as a model built from ideas gathered during interviews, inspections and investigations of a number of different types of businesses and industries. The vehicle used to illustrate this point is a generic sales and service operation.

A Hypothetical Model

Let's say our hypothetical organization has a manufacturing section that generates a product at a cost of

portantly, TQM is not change for the sake of change. It often requires short-term sacrifices for long-term gains. It may require some surrendering of ground now in order to lay the framework for greater advances in the future. While the importance of customers to the longevity of an organization seems fairly obvious, the relevance of the concept of internal customers and the proper application of metrics is often ignored.

Change Can Be Difficult

In whatever form it takes in differ-

\$500 per unit, with an expectation of .5 service calls per year. They, in turn, sell this product to the marketing section at a slight markup (say \$600). To cover the cost of administration, advertising and expected profit, marketing releases the product to the retail section for about \$800. The customer will probably see the product on the shelf for about \$1500.

In addition, a service contract will be sold to show a profit based on the .5 service calls per year. If, in the process of development, the manufacturing organization discovers that the cost is actually \$600 to make the product, they will show a reduced profit margin within the division if they release the product to marketing for the original price. Because of factors such as lead time and other considerations, elevating the price to marketing is generally not acceptable.

Manufacturing can meet their \$500 target price if they spent money internally to engineer the cost of the product down or accept a lower reliability rate (say .6 service calls per year). This will eat into the expected profit margin of the service operation since they based their service contract on the .5 figure. However, this is not an immediate concern of the manufacturing operation since, on paper, they met their quarterly revenue goal and profit margin. The real dichotomy of this predicament is the fact that manufacturing's profit report (the metric by which they are measured), will look better if they release the product to marketing with the higher service rate.

Clearly, manufacturing does not view service, marketing or retail as internal customers. In this case, the short-term success of the sub-operation has taken priority over the larger association. The division looks good, but the organization as a whole suffers. The impact of this situation becomes more significant when you consider the following additional in-

formation. Our hypothetical organization makes about two-thirds of its revenue from the sale of its products. Of this revenue, only about 10 percent is profit.

The remaining one-third of revenue comes from the servicing of its products. Of this portion of generated revenue, about 90 percent is profit. Ironically, little or no incentive exists to produce a more reliable product since doing so will reduce the overall profit margin. However, there are those organizations who reached the realization that customer satisfaction is not defined in terms of how fast the repair man deploys every time the product breaks down. What the customer wants is reliability — not repairability. These are the types of obstacles the TQM concept has to overcome if we expect it to achieve maximum potential.

A Look at What Quality Is

Despite a wide range in variation of response to a certain dosage of TQM, the bottom line remains that changes are necessary to make truly "quality" organizations. Further, they must be put into place with both strategic and tactical objectives in mind. Since to this point, we spent a good deal of effort examining what quality is not, perhaps a look at the other side of the issue is in order.

One view expressed by Russel G. Redenbaugh, a partner in Cooke & Bieler Inc., states that, "There is no single measure of quality. It is an assessment. It is an opinion, a verdict."⁴ Given this definition of quality, then the next questions to answer are — who is qualified to make this assessment, form this opinion or pass this verdict? The answer to all three questions is the customer! Quality is in the eye of the customer. You may produce the best widget on the face of the planet, but if the customer has no need for widgets, you go broke. The point here is that knowing your customers' needs and desires gives you

the target at which you aim your quality effort.

One of the more successful and popular ways of determining customer needs is the Quality Force Deployment or QFD. The concept of QFD involves literally deploying a well-defined team of experts from your organization to the customer. The team will use tools such as interviews, questionnaires and observation to definitize customer expectations. Basically, QFD is —

- a systematic and measures-related method of determining how to satisfy customers;
- a way of establishing the baseline for specifications and standards by which you develop metrics for the evaluation of success;
- a quantitative way of calculating your customers needs; and
- a technique used to identify customer desires and insure incorporation into new designs.

Once you determine these needs, you have a starting point to develop the most efficient and effective ways of meeting them. One of the more difficult tasks involved in the TQM process is making a tangible entity out of this nebulous concept called quality. While there is plenty of help out there (none of it free or cheap), I present the following information as one of many options that can be used as a possible starting place.

ISO 9000

In the process of doing research for this article, I had the opportunity to interview a team of quality experts from Underwriters Laboratories and the British Standards Institute. This team consisted of specialists in particular fields of endeavor (petroleum engineering, software, manufacturing, supply line management, etc.). They (and other teams like them) were hired by companies all over the world to perform assessments of the processes used to produce goods or services.

The sponsor of this quality inspection effort is the International Standards Organization or ISO. Based in Belgium, the ISO is a consortium of 120 member nations who, over the last 5 to 10 years, established generic, tailorable guidelines for business and industry to use in documenting process control to ensure consistent, quality products. These standards are described in detail in a document known as the ISO 9000.

The document establishes 20 basic elements of what a quality system should address, and then expands these elements to fit unique applications in individual organizations. They examine these processes from a quality standpoint — not so much the finished product, but rather the sequence of events set in motion to achieve the final goal. The vehicle used to examine quality systems is very simple, which allows it the flexibility to be used in a wide range of applications. This examination of process control centers focuses on three basic questions. Is it documented? Is it followed? Is it current?

The thrust toward meeting quality standards took on such importance that the European Common Market countries announced a requirement for organizations to be certified and registered to the ISO 9000 standard in the near future, or face the possibility of not being allowed to market one another's products in the European Common Market. Collectively, the five-person team I interviewed accomplished quality assessments for around 5000 companies and business interests worldwide.

Model of a TQM Success

In an ad hoc discussion, I asked the team to build a model of what they perceived a quality organization in today's environment might look like. The following is a summary of their comments: Those organizations making inroads into the quality market are, in general, less than 20 years old. They are not burdened by years of

tradition and are amenable to new approaches. They pay a great deal of attention to what is termed "implied customer desire" or expectations of the client.

Organizations who have problems with the "quality" concept concentrate on meeting customer requirements rather than customer satisfaction. In other words, they practice specification compliance versus operational suitability (sound familiar?). They understand that quality is defined in terms of the customer, not internally by the organization. They also realize that each customer has their own culture, and they are ready and willing to react to different cultures.

For those organizations who pursued TQM (including those who achieved varying degrees of success), the going was rough. The admission that the way you always did something may have been counterproductive is difficult, particularly if a style or methodology was in place for generations. Despite the evidence, there remains a significant faction whose school of thought is that TQM is doomed to failure. If this mind set is allowed to remain in your organization, it becomes a self-fulfilling prophecy. While there remain some exceptions, the old school view of management and quality is still posing a significant challenge. A somewhat disappointing observation is that groups or individuals who downplay the impact of TQM know something is wrong, and they may even have an idea of how to fix it. However, their inbred paradigms are so strong and tender so many roadblocks, that the necessary becomes the impossible.

Goals of the Organization Demand Precedence

The TQM process focuses on keeping what is value-added for the system and discarding the rest. For this to work, the overall goals of the organization demand precedence over sub-groups or individuals. This

requires sacrifice and a selfless approach to objective accomplishment — selfless in the sense that personal goals take a lower priority than those of the organization. Carried to a somewhat ridiculous extreme, truly selfless individuals would remove themselves from organizations if they determined an inability to add value to the system. More than ever, customer expectations of a product or service are very high. Organizations today are dealing with a more complicated society and an infinitely more complex set of variables. You will pay the price for quality — but, at least for today, the customer is willing.

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THE BENEFITS OF JOINING THE DSMC ALUMNI ASSOCIATION

*A Forum for Continuing Professional Growth
Within the Acquisition Community*

Paul T. McMahon

The objectives of the Defense Systems Management College Alumni Association (DSMC-AA) are to provide its members with a forum for continuing their professional growth within the acquisition community; and to augment their exposure to acquisition expertise from the Department of Defense (DoD), the Defense Systems Management College (DSMC), other association members, other government agencies and industry. Today, these objectives continue to relate to progressive acquisition reform.

Changing Laws and Regulations

Over the years, the many DSMC graduates continued to manage a DoD acquisition system that develops and acquires the best weapons systems in the world. For the past 2 years, faced with significant changes to our security requirements as a nation, DoD has been reforming our acquisition system to adjust to declining defense



**This year an added
feature will be a
Job Fair offering
opportunities for
those in pursuit of
professional
change.**

budgets and develop technology more effectively using more commercial opportunities. Attending the DSMC-AA sponsored events helps members keep abreast with and understand changes to laws and regulations that impact upon their effectiveness to viably perform in the acquisition arena.

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Program Managers Symposium

Each year the DSMC-AA hosts a showcase event with the Program Managers Symposium. This year, the 12th offering, focuses on "Implementation of Acquisition Reform," and will be held at the Fort Belvoir main campus July 17-19, 1995. Organizers of this spectacular gathering hope to feature Honorable John M. Deutch, Deputy Secretary of Defense, as the keynote speaker. Secretary Deutch is expected to speak on "Reengineering Defense Acquisition." Mrs. Colleen A. Preston, Deputy Under Secretary of Defense for Acquisition Reform, is invited as Banquet Speaker to address the topic of "Acquisition Reform — The First Year." The symposium presents a host of high-level acquisition experts, including the Service Acquisition Executives: Mr. Gilbert F. Decker (Army), Mrs. Nora Slatkin (Navy), and Mr. Clark G. Fiester (Air Force), who will form a panel to provide the Service views of acquisition reform.

The symposiums also host a series of 90-minute workshops on current trends and initiatives in the acquisition arena. Attendees usually share many experiences and develop new points of contact with colleagues from

various organizational elements within our world of acquisition management. Social events associated with the symposium will also be a part of the agenda. In addition to daily luncheons with guest speakers, attendees can enjoy informal discussions with many of the distinguished speakers at a scheduled formal banquet. This year an added feature will be a Job Fair offering opportunities for those in pursuit of professional change.

Access to Other Acquisition Professionals

The DSMC-AA provides members with a national association and a network to access other professionals in the field of systems acquisition. Local area chapters are established in the Capital Area (Metropolitan Washington, D.C.); Dayton, Ohio; and the Tennessee Valley (Huntsville, Ala.). The Capital Area Chapter hosts monthly lunch-time seminars on timely acquisition subjects. These seminars are well attended.

DSMC-AA Newsletter

The DSMC-AA publishes the quarterly *DSMC Alumni Association Newsletter* to inform members on matters affecting the College and the acquisition community. The newsletter provides information on membership activities, feature articles on current acquisition events, and is one of the primary vehicles for providing members with a listing of free course offerings on campus in conjunction with the Program Management Course (PMC) electives program. The PMC classes invite DSMC-AA members to participate in elective classes that penetrate deeper into many of the subjects covered in the PMC curriculum. These well-attended, popular electives, which are structured similar to the format used by the Program Managers Symposium workshops, are well received by our members and lauded as informative and beneficial.

The newsletter also includes a feature section entitled, "The Acquisi-

Membership in the association provides opportunities for continued professional involvement and participation in defense acquisition activities.

tion Spotlight," which brings visibility to some of our members and highlights notable successes in their acquisition careers. The newsletter also strives to provide colorful stories concerning specific events and accomplishments of as many of our members as is practical.

Continued Professional Involvement

The benefits of DSMC-AA membership extend beyond the scope of a national symposium, local chapter seminars, electives and meetings. Membership in the association provides opportunities for continued professional involvement and participation in defense acquisition activities.

As the focus of DSMC evolves from exclusive "defense" acquisition management activities into more commercial applications of the program management concept and function, DSMC-AA members will continue to grow and keep abreast of these changes through participation in DSMC-AA sponsored events. They will be able to maintain contact with other members through the use of the membership directory, and DSMC-AA membership will facilitate awareness of timely updates on evolving acquisition policy, procedures, issues and lessons learned.

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AN ALTERNATIVE ENVIRONMENTAL STRATEGY

Is Government Inundating Industry with Overly Ambitious Environmental Requirements?

Michael E. Heberling

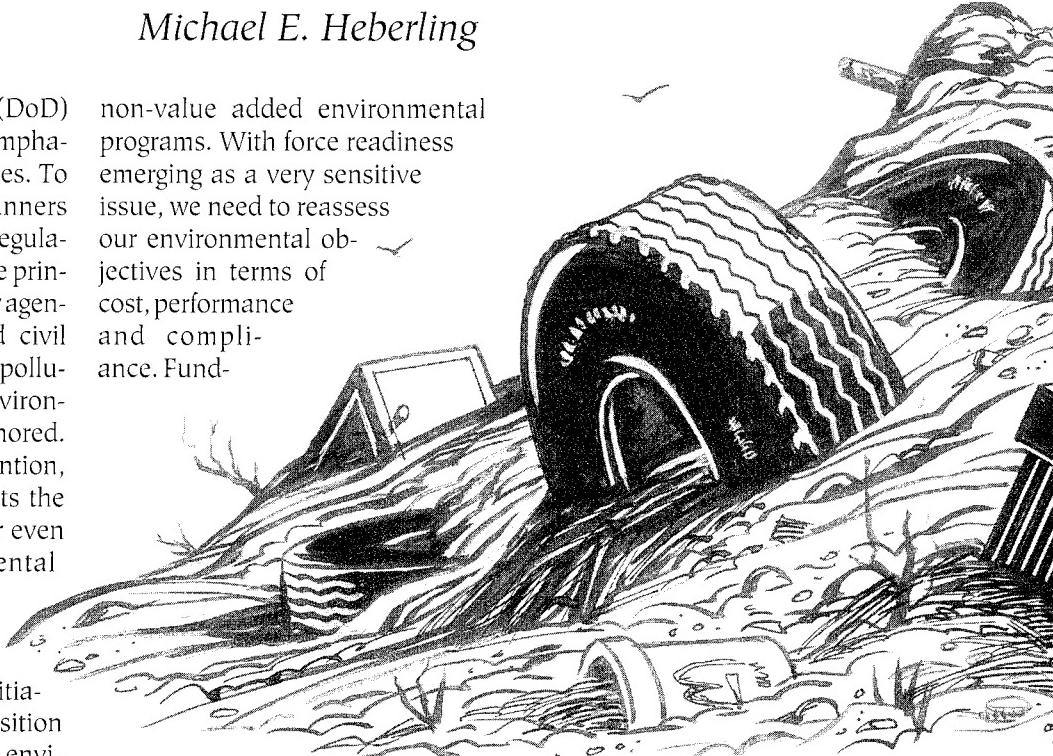
The Department of Defense (DoD) is placing an increasing emphasis on environmental issues. To date, environmental planners have focused on cleanup and regulatory compliance. As a result, the principal players were the regulatory agencies, the legal profession and civil engineers. By comparison, the pollution prevention side of the environmental problem was largely ignored. In the area of pollution prevention, the acquisition process presents the best opportunity to mitigate, or even eliminate, future environmental problems.

We should not, however, suddenly abandon cleanup initiatives only to inundate the acquisition process with overly ambitious environmental requirements. The strategy we need is an integrated environmental strategy that looks collectively at all of our acquisition, operations and maintenance functions. The best approach recognizes that there must be trade-offs. In an era of decreasing defense budgets, we can ill afford

non-value added environmental programs. With force readiness emerging as a very sensitive issue, we need to reassess our environmental objectives in terms of cost, performance and compliance. Fund-

ing environmental projects should not come at the expense of national security.

Consequently, we must pursue a "win-win" environmental strategy — one that is both good for defense and good for the environment. A coherent environmental strategy can lead to more efficient processes, improvements in productivity, less waste, and lower compliance costs. The trick is to find alternate ways to get the job done that make environmental as well as business sense. In many operations, areas overlap between the goals of the organization and the environmen-



tal movement. Management should concentrate its attention and limited resources in these common areas.

Environmental Compliance

In the face of new environmental legislation, managers frequently take the expedient short-sighted approach. They focus on the borderline of regulatory compliance/noncompliance. At best, they will treat environmental factors as "add-on's" to their normal operations. At worst, they will cynically view environmental protection as just one more expensive and unavoidable bureaucratic obstacle. Few organizations have an environmental

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strategy that addresses their day-to-day operations as well as their long-term objectives.

The environmental movement will never take hold unless two basic changes occur. First, management must come to view environmental initiatives as complementary, not contradictory, to organizational goals. The second change applies to state and federal regulatory agencies. They must thoroughly understand that we are in an era of increasing domestic and international competition. Neither industry nor the DoD has idle re-

10 percent may be desirable; however, this may mean a 50-percent slippage in the schedule or a 100-percent increase in the cost. The same analogy applies to environmental requirements. With overly stringent environmental specifications, compliance will take longer and be more expensive.

Similarities with Quality

The environmental debate has striking similarities to the quality revolution. Although quality was initially given a lukewarm reception by business, it eventually became the formula for success. Similar results are possible if both industry and government adopt sensible environmental practices.

In the pursuit of quality, business made basic changes in strategic planning and day-to-day operations. A "quality-first" philosophy is no longer seen as an additional cost, but rather as a competitive

advantage. If we can view pollution prevention and waste reduction as an untapped opportunity, the same result is possible in defense acquisition.

As with poor quality, pollution is an indicator of inefficiency because waste reflects materials not used in the production process. Pursuing a strategy of pollution prevention in the weapon systems acquisition process allows the defense industry to more efficiently produce products. Therefore, this approach makes economic as well as environmental sense.

Environmental Goals vs. Real-world Constraints

Today, many environmental initiatives run counter not only to business and defense interests, but also to environmental goals. Many of the proposed solutions impair progress, waste resources, and do little to solve real environmental problems.

Before the acquisition community can fully embrace the environmental movement, all parties must acknowledge that idealistic environmental goals, no matter how well-intentioned, must be tempered with real-world constraints. These include—

- performance;
- safety;
- cost;
- limited resources;
- technical limitations; and
- global competitiveness.

sources to fund increasingly restrictive environmental requirements.

Legislators must evaluate the need for more complex and stringent environmental regulation. As a minimum, they should standardize often conflicting requirements at the state and federal levels. From the acquisition perspective, there must be a balance between desirable and acceptable environmental requirements. In the acquisition field, we recognize the non-linear relationship among cost, schedule and performance. Increasing the speed or reducing the weight specifications of a weapon system by

FIGURE 1. Management Questions for Policy Formulation

1. Are the underlying assumptions correct?
2. This is a problem in relation to what?
3. What is 100 percent, and what is the percent we are concentrating on?
4. What is the trend: both short-term and long-term?
5. What is the real objective, and are we working to that end?
6. Is the proposed solution worse than the problem?
7. Do we, in fact, have a problem?

The following examples serve to illustrate the dilemma of conflicting goals:

Coffee Cups: Polystyrene or Paper? McDonald's quietly went back to using polystyrene cups after briefly using paper ones. They had earlier reaped a public-relations bonanza when they switched to paper to "help the environment." Why the switch back? Customers complained. Although they were all for helping the environment, they didn't like leaking cups or burning their fingers. It also turns out that polystyrene retains heat better, and on a per-cup basis, polystyrene is cheaper than paper.

Save People or Save the Environment? The M1 Abrams tank and the Bradley fighting vehicle both use halon gas in their automatic fire suppression systems. Halon can suppress a fire milliseconds after detection. However, halon happens to be a chlorofluorocarbon (CFC), said to be harmful to the earth's ozone layer. The United States signed the International Montreal Protocol agreement that bans the use of all ozone-depleting chemicals. In response, the DoD directed the Army to find a replacement for halon.

The Army identified four alternatives. Unfortunately, the top three candidates were rejected because they did not have an Ozone Depletion Potential rating of zero. Ultimately, they decided on the fourth alternative: carbon dioxide. However, this gas has three major disadvantages. First, it takes twice as much carbon dioxide to do the same job as halon. Next, we trade one environmental problem for another. Carbon dioxide happens to be one of the global warming gases. The third drawback, however, is the most severe. The amount of carbon dioxide needed to suppress an internal fireball in the tank turret would kill the crew.¹

Automobiles: Gas or Electric? Gasoline-powered cars have two problems.

While depleting a non-renewable resource, they pollute the environment. On the positive side, they are cheap, convenient to use, and have near unlimited range (no overnight charging required).

Advocates of electric cars are advertising them as an environmentally friendly alternative. Three primary sources of battery power are: lead acid, nickel cadmium and sodium sulphur. Each has advantages and each has significant disadvantages.

- The lead acid battery allows travel at speeds of up to 25 mph for a maximum range of 100 miles before recharging. However, the battery is heavy and takes up considerable space.
- The nickel cadmium battery is 50 percent more powerful. However, it costs \$30,000 and requires replacement every 2 years [not to mention the environmental problem of disposal].
- The sodium sulphur battery is three times more powerful. However, it runs hot (600 degrees Fahrenheit) and is very volatile. When exposed to water in a crash, the result is a vehicular "meltdown."²

Several environmentally progressive states recently mandated that automakers build zero-emission vehicles. Also, California directed major automakers to convert 2 percent of their yearly sales — about 40,000 autos — to zero emission [read: battery-powered] vehicles by 1998. That total increases to 5 percent by 2001, and 10 percent by 2003.³

All parties must assess this socially appealing goal in terms of current technology. Electric vehicles are not new. They actually predate gasoline-powered ones. However, in spite of more than 100 years of extensive battery research, advances in electric power, weight reduction and cost were marginal at best. These drawbacks

decidedly limit the marketability of electric cars. Therefore, mandating a technological breakthrough will not overcome the inherent limitations. The preceding examples show that environmental goals, no matter how noble, must be flexible enough to accommodate real-world constraints.

Guidelines for an Environmental Strategy

Since we cannot do everything, we must choose our environmental priorities wisely. Frequently, areas overlap between the goals of the firm and the environmental movement. We can make more gains on the environmental front if we focus on those common areas.

Figure 1 provides guidelines for developing environmental goals and policy. Honest answers to these questions will help to eliminate goals that are: 1) the most trivial; 2) unsubstantiated; 3) emotionally driven; and 4) cost-prohibitive. Those that remain will truly warrant attention. They will also be more likely to gain and maintain the support of the acquisition community and the public.

Are the underlying assumptions correct? Before we devote massive resources to solve an environmental problem, we must first determine that a problem, in fact, exists. For example, were the acidic lakes in the Northeast the result of acid rain or naturally occurring forces? The National Acid Precipitation Assessment Project, commissioned by Congress, sought to determine just that. Surprisingly, the findings of this \$600 million project did not substantiate the conventional wisdom of the acid-rain problem. In spite of evidence to the contrary, Congress passed the acid-rain provisions of the Clean Air Act of 1990. As a result, American businesses and consumers will now pay \$10 billion annually in compliance costs.

This is a problem in relation to what? Provide a frame of reference for the severity of the problem. By compar-

ing our waste disposal problems with other industrialized countries, it becomes clear that the issues are more political and social, than physical. In his book, *In Defense of Garbage*, Judd Alexander identifies plenty of space for landfills in this country. The U.S. has the lowest population density of the industrialized nations. The real problem lies with the increased costs posed by new disposal standards. This includes the dwindling capacity of existing facilities meeting new codes, and the NIMBY (Not In My BackYard) attitude toward establishing new facilities.⁴

What is 100 percent, and what is the percent we are concentrating on? We should concentrate our attention and limited resources on the biggest part of a problem. This is especially true in an era of decreasing defense budgets. Ironically, we tend frequently to do just the opposite. We devote massive resources on just a fraction of a problem.

The reduction of automobile exhaust emissions is a desirable environmental goal. However, our efforts focus almost exclusively on new cars through increasingly restrictive and costly legislation. Unfortunately, we are very near the technological limit of pollution abatement in new cars. We experience costly diminishing returns as we try to further reduce pollution.

An analysis of the entire auto emission problem was very revealing. Between 50-80 percent of the pollutants come from just 20 percent of the cars (and these are not the new ones). It would be more economical and environmentally effective to target the older cars that account for the majority of the pollution. As a first step, several communities in Illinois and California established a "cash-for-junkers" program.

An alternative solution to the diminishing returns problem in new cars is to broaden the definition of: *What*

is 100 percent? Over one-half of automobile pollution comes from gasoline evaporation. This occurs during refueling and when the car is parked. Seeking ways to reduce evaporation can have economic as well as environmental advantages.

What is the trend: short-term as well as long-term? Three points require emphasis. First, a one-time occurrence is not a trend. Next, it does not make environmental or economic sense to rectify a problem that is correcting itself. Finally, past trends using real data are better indicators of the future than fictitious modeled ones.

The public seriously believes the world is rapidly running out of natural resources. This belief, in part, stems from computer models that project future shortages based on current usage. The "Club of Rome's" 1972 book, *The Limits of Growth*, made many dire predictions on the future availability of natural resources. Their model left out two crucial variables. First, the impending scarcity of materials causes people to seek more economically attractive alternatives. And second, advances in technology allow us to do far more, with far less.

The first computers filled an entire room with tubes, metal and wiring. They also required extensive energy to operate. Today an 8-pound laptop computer far exceeds the capabilities of its primitive ancestor. We are increasingly replacing raw materials with ideas, information and new technologies.

Copper is one of those metals supposedly destined for extinction. The communications industry uses copper extensively in cables. Two technological advances reduced the need for copper: the adoption of fiber optics and satellites, which revolutionized the communications industry. As a result, copper usage is a fraction of its earlier level. A pound of glass fiber-optic cable, composed mainly of sand, can carry as much information

as a ton of copper.⁵ This same trend exists for other metals as well. If we were running out of these materials, rising market prices would result. However, we see just the opposite. The relative prices for most metals continues to decline. We are moving away from metals toward lighter composite materials.

What is the real objective, and are we working to that end? A joint Environmental Protection Agency (EPA)-Amoco Corporation study looked into the actual emissions from the Yorktown oil refinery. The main pollution problem was benzene, a carcinogenic byproduct of oil refining. The EPA drafted the benzene abatement requirements in 1990. However, the basis for those standards was a 1959 study of benzene evaporation in waste water. To ensure compliance, Amoco spent \$41 million to trap air pollution from the refinery's waste-water system. When the benzene emissions were actually measured, they were 20 times less than predicted by the 1959 study. The real pollution took place on the loading docks, where the fuel is pumped into barges. This activity produced five times as much benzene pollution from the waste-water system. The irony is that EPA rules do not even address the loading docks. Amoco could have corrected the real problem for only \$6 million.

Based on these findings, Amoco petitioned for an exemption to the rules requiring it to complete its massive \$41 million sewer system. The EPA said no! There was no procedure to waive existing environmental laws and regulations, even though they were contradicted by an EPA-sanctioned study.⁶ In this case, was the EPA goal to reduce pollution, or to perpetuate government bureaucracy and red tape? This illustrates a "lose-lose" example. Business was a loser, the consumer was a loser, and so was the environment.

Is the proposed solution worse than the problem? Although we might have

a problem, the better alternative might be: *just learn to live with the problem*. Toxic materials become a problem only when they occur in high concentrations (in soil, water or air). Asbestos falls in this class. Near hysteria resulted a few years ago with the discovery of asbestos in many schools across the country. The building industry used asbestos extensively as a fire-retardant insulator in ceilings and walls. The actual asbestos concentration in the classroom was minimal, and so was the threat to children. This condition, however, was unacceptable. Instead of using money for education, school systems wasted millions to rip out the inert asbestos. As a result, the concentration of asbestos fibers in the air skyrocketed. And so did the risk to children.

Do we, in fact, have a problem? For many in the environmental movement, the elimination of packaging has become a crusade. We assume packaging to be the biggest villain in our solid waste crisis. Germany imposed a draconian package recycling program that gives little regard to the cost or market inefficiencies that result. Before we too embark on a similar path, let's first answer two questions. First, how much packaging goes into landfills relative to other waste? And second, why do we have packaging in the first place?

Consumer packaging discards account for only 10 percent of the waste in landfills. In contrast, just three components account for over 50 percent of the total. These are: 1) construction and demolition debris; 2) landfill lining and cover materials; and 3) yard waste. The United States has more yard waste on a per-capita basis than any other nation.

As late as 1939, U.S. cities were reporting annual per-capita discards of garbage, ash and rubbish 20 percent greater than we now find. In Mexico today, the per-person/daily discards are 20 percent more than their U.S. counterparts. The differ-

ence in both comparisons stems from advances in food packaging that result in less overall waste and spoilage. In 1987, the percent of food spoilage in the United States was 17 percent. This compares with 50 percent for the former Soviet Union, and 70 percent for India. According to United Nations statistics, Americans discard less food waste than any other country in the world.⁷

Packaging provides a valuable environmental service. Without it, we would have more waste due to higher levels of breakage and spoilage. Thus, the preservation and waste avoidance advantages far outweigh packaging's disposal disadvantages.

Every Alternative has Costs, Benefits and Consequences

We must base environmental decisions on scientific facts and a thorough analysis of alternatives. There is no "silver-bullet" solution to environmental problems. Most problems are not really problems at all. They are simply situations that require the weighing of trade-offs between alternatives. This is especially true with environmental problems.

Every alternative presents a new set of problems. We are quick to choose expedient solutions with apparent positive results. However, these short-term solutions can have unexpected, long-term negative results. We must seek to determine the costs, benefits and limitations of each alternative.

Environmental Life Cycle Analysis

One tool to weigh trade-offs is environmental life-cycle analysis. The decision to replace or phase out a material for environmental reasons must consider more than just the end product. To determine the true environmental cost of each alternative, managers must look at the entire life cycle of a product. This would include an assessment of all the materials, by-products and processes that go into,

or result from, making a product. The analysis begins with raw materials and ends with final disposal of the product.

To evaluate the environmental cost of each alternative, the following are suggested areas to measure:

- volume of raw materials used;
- volume of toxic materials used and produced;
- water consumed;
- energy used;
- transportation expenses;
- waste discharged into the ground, air or water; and
- volume of the final product ultimately discarded.

Environmental Strategies

For environmental programs to succeed, organizations need to rate their operations using the environmental life-cycle analysis. Once the analysis is complete, the company should pursue a strategy that balances environmental concerns with the realities of the marketplace (domestic and international).

Figure 2 provides a list of potential environmental strategies, divided into two broad categories: pre-manufacturing or design-related approaches and post-manufacturing. The latter group includes many reactive "end-of-pipe" strategies such as cleanup and recycling. Unfortunately, these two strategies garner the majority of the attention and the money allotted to environmental issues.

The key is to view all strategies collectively, which will help organizations develop an integrated environmental strategy. Also, regulatory agencies should provide the latitude to choose one or more strategies. The goal is to have options that make both environmental and business sense (for a particular industry).

Environmental policy makers and the regulatory agencies must fully comprehend the following: "No one

solution fits all industries, nor all situations within the same industry." As we saw in the EPA/Amoco example, mandating one solution can be inefficient as well as counterproductive. Frequently, the unorthodox approach provides the best solution.

Many of the strategies are complementary to each other. In other cases, they can be mutually exclusive. By making products out of an array of materials, durability increases. This, in turn, increases the product's longevity — a desirable environmental trait. However, the multi-material composition makes the popular recycling option far more complicated and less practical.

Recycling: Pros and Cons

The overemphasis on recycling illustrates the familiar adage of "too much of a good thing." Most recycling programs experienced limited financial success (and this is being generous). *Recycling will only work if there are well developed end-markets for recycled products.*

Recycling advocates are quick to make a point. Recycling will work only if people buy recycled products. But they will only buy recycled products that are cost competitive with the non-recycled products. Barring this crucial ingredient, advocates appeal, with limited success, to everyone's sense of responsibility to be good [environmental] citizens.

Recycling comes with a tragic irony. The more successful a recycling program becomes, the more it floods the limited markets. This depresses the resale market that, in turn, raises the cost of the recycling program. Many environmentally supportive consumers are beginning to wonder why the cost of their trash collection increased after their localities implemented a recycling program.

Neither industry nor the DoD should recycle just for the sake of recycling. Nor should regulatory agen-

FIGURE 2. Environmental Strategies

Pre-Manufacturing (or Design) Environmental Strategies:

Elimination—A part of a product is discontinued with little or no impact to the function of the product. Example 1: Selling toothpaste by the tube only, the outer box package is eliminated. Example 2: Electronic-Data-Interchange eliminates the use of paper as a communication medium.

Source Reduction/Concentration—The volume of a product is reduced yet it still functions at, or near, the same performance level. Example: Liquid laundry detergent is concentrated so that now only half the amount is needed to meet the same performance level.

Substitution—The replacing of a toxic material with a nontoxic one with near the same level of performance.

Extend Useful Life—Making products more durable postpones the ultimate disposal problem. Example: Automobile tires now have a longer useful life.

Process Modification—Example: Changing the production or operations process so as to use less energy and yet still accomplish the same function.

Post-Manufacturing (In Some Cases "End-Of-Pipe") Environmental Strategies:

Recycling—A material or product undergoes a second manufacturing process to become the input component of a second product. Examples: Paper, glass, and aluminum.

Resource Recovery/Reclamation—Only a portion of an end-product is reused or recycled. Example: Reclaiming silver in the photography development process.

Reuse—A product is repeatedly used "as is" with no secondary manufacturing process, as opposed to recycling. Examples: Returnable bottles and shipping pallets.

Incineration—The burning option has the potential to reduce the weight of waste destined for a landfill by 80 percent and the volume by 90 percent.

Composting—The process of biodegrading organic material — yard waste, food and paper — into compost or humus.

Treatment—By chemically or biologically treating a toxic material, it becomes inert or non-toxic.

Disposal—The most expedient solution where waste products/materials are simply disposed of "as is" in a landfill.

Containment—Extremely toxic or hazardous materials are sealed or "entombed" as the only viable solution.

Clean-up—This is an unplanned solution to a waste problem that results from an accidental spill or the leaking of some storage facility.

cies (at the city, state or federal level) mandate recycling just for the sake of recycling. For some products, such as aluminum, recycling is cost-effective. The process to recycle aluminum consumes 80 percent less energy than the smelting of new bauxite ore. And there happens to be a well-developed market for recycled aluminum. For other products, however, recycling makes neither environmental nor economic sense.

Glass

In contrast to aluminum, glass recycling reaps only marginal benefits. Glass is heavy, resulting in higher monetary and energy outlays due to increased transportation costs. Interestingly, making new glass and melting existing glass use roughly the same levels of energy. However, to recycle existing glass requires a costly sorting process. Recycled glass also has a "clouding" problem when different colors are mixed or if impurities exist. And finally, sand, the major ingredient in glass, is plentiful and inexpensive. For this reason, making new glass is usually more cost effective than recycling.

Even in Seattle, nationally known for its aggressive recycling program, glass presents a significant challenge. Two years ago, used glass sold for \$30 a ton. Last year, Seattle's recycling program collected 40,000 tons of glass. This overwhelmed the state's only commercial glass furnace, which had a yearly capacity limit of 32,000 tons. As a result, the bottom fell out of the glass recycling market. The city is now stockpiling glass in the hope that the market will somehow improve. Ironically, some of the glass was even dumped into landfills.⁸

For glass, alternatives exist besides recycling. Many remember as children collecting deposit bottles for some extra spending money. As a side benefit, the roadsides, fields and parks were kept free of discarded bottles by those young [environmental] entrepreneurs. This is an excellent example

of the reuse strategy. Here, the product is reused in its original form without going through another potentially pollution-producing manufacturing process, as in recycling. However, this approach includes the environmental and monetary costs of cleaning (water, detergent, energy and discharge) and, as in recycling, additional transportation expenses.

A second alternative for glass is source reduction. For years, the glass industries have been using a new "Light-Weighting" process that maintains the function of glass as a container. However, glass uses less materials in its production. Today, glass bottles are 25 percent lighter than they were in 1984. Did the glass industry change its manufacturing process for altruistic environmental reasons? No, they made the change because it made economic sense. It just happens to make sound environmental sense as well. That is the whole point. Government and industry should strive for solutions that make both environmental and business sense.

Paper

Management should concentrate its attention on those problems that: 1) are large relative to other problems; and 2) exhibit a trend showing the problem is getting worse. Paper falls into both categories. If we consider all paper — packaging, office paper, newspapers and "junk mail" — it becomes the largest component of landfills at 40 percent. And the trend is increasing.

Ironically, advances in technology aggravate the paper problem. Our use of paper increased significantly as a result of the use of laserjet printers and department copy machines. Every office is now a miniature print shop. We no longer use "white-out" to correct minor mistakes — we reprint the entire document. We also make far more extra copies than we need — *to be sure*.

What is the best environmental

strategy for paper? The near unanimous response would be recycling. Unfortunately, paper recycling presents us with another dilemma. As in the glass example, the more popular paper recycling becomes, the more that success undermines the program. In some parts of the country, it is cheaper to take old papers to the landfill than to recycle them.

An alternative to recycling and better solution is to combine source reduction with recycling. One way to reduce paper usage is to send all interoffice correspondence (reports, letters and "flyers") through electronic mail. Besides the in-house efforts, electronic data interchange and paperless contracting represent a similar approach between suppliers and customers. The use of an electronic medium helps the environment in two respects: less office paper to either end up in landfills or to be recycled; and best of all, the financial incentive to improve the company's bottom line.

Beyond the Organization

Besides the obvious in-house efforts, the environmental strategy should extend beyond the firm. This will require cooperation between customers and suppliers. In other cases, it may even make sense to cooperate with competitors or with unrelated industries.

We are in an era of reducing the number of suppliers to each firm. In many cases, this results in closer buyer-supplier relationships. Just-In-Time delivery practices then become practical for many industries. Because of reuse and recycling strategies, this also generates ensuing economic benefits. As an example, firms can adopt reusable containers and pallets. Or, they can jointly develop packaging that is reusable or, at least, easier to recycle.

All manufacturers of dry cell batteries agreed to stop using mercury — a highly toxic metal — in their products. This socially acceptable form of

industrial collusion eliminates the risk of mercury pollution. Mercury is no longer a problem at the manufacturing front end or at the disposal end of a product's life cycle. Dura-cell uses this change for marketing mileage. Their battery packages now display an "environmental green" design with the words "Environmentally Improved" at the top. For Polaroid, the elimination of mercury helped to make their batteries recyclable (Figure 3).

One industry's trash can be another's treasure. Many cement manufacturers use the strategy of resource recovery. They use the wastes from other industries as an ingredient in their cement products. In another case, a furniture manufacturer sells fabric scraps to the auto industry for use as car lining. They also sell their leather trim scraps to a luggage company to make attache cases.

Under the proper circumstances, the incineration strategy can meet multiple environmental goals. Wheelabrator Technologies Inc., has 14 incineration plants that burn trash

at very high temperatures. This reduces the weight of the trash by 80 percent and also decreases the volume by 90 percent. This process helps to decrease the rate at which landfills reach capacity. Another environmental benefit is possible from incineration. Wheelabrator uses the heat from the process to drive turbines that generate electricity for 6 million people. This reduces the consumption of oil by more than 10 million barrels a year.⁹

Conclusion

The solutions to our environmental problems must come from the collective and cooperative ideas of business, government and individuals. If we continue down the current path of draconian environmental legislation, we will all lose. Businesses will either leave the country or fatally focus on the borderline of regulatory compliance/noncompliance. In the DoD, decreasing funds sorely needed to maintain force structure and readiness will be diverted for environmental compliance. Currently, there appears little incentive to develop a

visionary environmental strategy. Both industry and the DoD need a comprehensive environmental policy that addresses the following realizations:

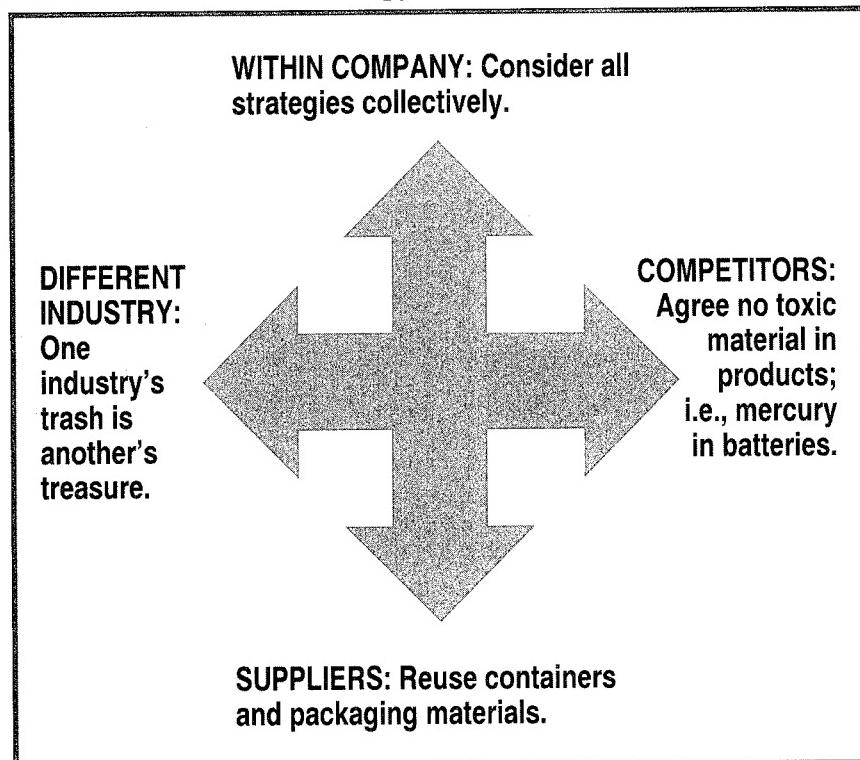
- We cannot do it all.
- We do not have unlimited resources (money, time or people).
- We cannot afford non-value added activities in the face of global competition and declining defense budgets.
- We should concentrate on "big-ticket" problems based on sound scientific data rather than on emotions or conventional wisdom.
- We should develop general environmental goals with enough flexibility to accommodate unorthodox solutions.

If we can follow these basic principles, we can expect to achieve, ultimately, a "win-win" solution — one that is good for the *environment*, good for *business* and good for *national defense*.

Endnotes

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7. Alexander.
8. B. Richards, "Recycling in Seattle Sets National Standard but is Hitting Snags," *The Wall Street Journal*, 3 August 1993, pp. A1 and A4.
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FIGURE 3. Best Strategy — A Combination



STUDENTS LEARN THE VALUE OF TEAMWORK THROUGH EXPERIENCE

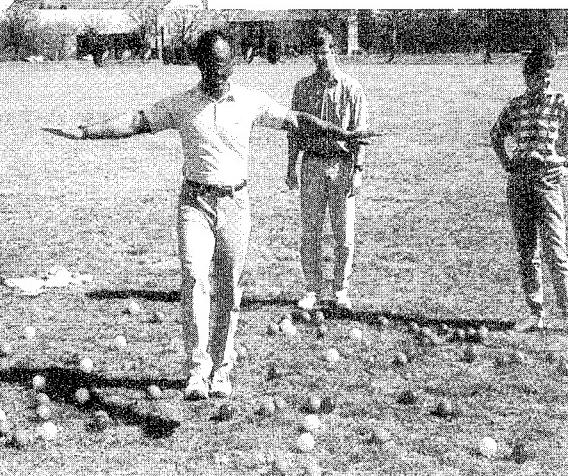
Professor Don Fujii, Department Chair, Managerial Development, Faculty Division, recently orchestrated several teambuilding exercises with the students of APMC 95-1. The students gathered on the Fort Belvoir Parade Field on 17 March 1995 as part of an exercise in coalescing as a learning team. The results, as pictured, clearly demonstrate that working as a team and following instructions are not, in reality, always so simple.



Titanic Porthole. Students try to pass a fellow classmate through the "porthole" without touching the rim. Those unfortunate enough to touch the rim are instantly "electrocuted," and must start over again.



All Aboard. The object of this exercise is to get 10 people aboard a platform measuring about 18" x 18" without anyone touching the ground.



Scud Missile Doublecross. The balls represent a minefield, and fellow team members give verbal instructions in navigating to avoid the mines. The problem is, the opposing team is also allowed to shout instructions — the problem then becomes who to believe!



The Trolley. Constructed like a centipede, each participant stands on a board, interconnected with all the other boards. Ropes and hand-foot coordination control the "centipede's" movement. The object is to get everyone lifting their feet and the ropes in the same direction, at the same time — obviously not as easy as it looks judging from the student on the right who lost his balance.



Poison Peanut Butter Pit. Students must navigate to the finish line walking on boards atop rollers, without the boards or their feet touching the ground. If they make contact with the ground, they've fallen into the pit. To make it more interesting, they cannot leave boards or rollers behind, and must cross the finish line with all the equipment they start with.

Photos by Ed Boyd

TECHNOLOGY EXCHANGE — A GUIDE TO SUCCESSFUL COOPERATIVE RESEARCH AND DEVELOPMENT PARTNERSHIPS

Battelle Press

Edited by John Lesko and Michael Irish

This book offers advice, guidance and insight for those engaged in or considering a government-industry technology partnership. The reader will benefit from "best practices" and "lessons learned" drawn from an analysis of successful ventures and interviews with key practitioners and technology managers from the public and private sectors.

Technology Exchange addresses the technology transfer mechanisms available to those wishing to enter into the world of technology transfer. The editors focus on the Cooperative Research & Development Agreements (CRDA), a flexible and increasingly popular mechanism in use today.

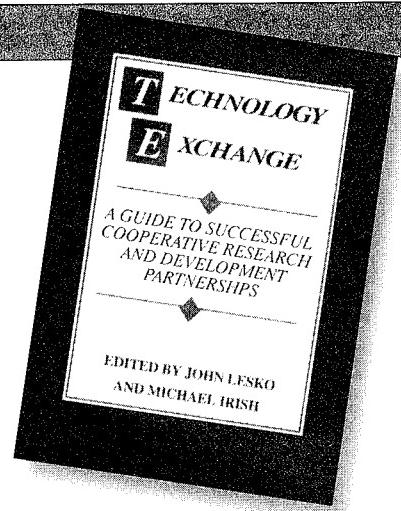
The foreword, preface and acknowledgments tell the reader that this book is the product of a year-long study of the Air Force's technology transfer program. However, the editors have assembled a guidebook that has a much broader audience than the military and its commercial partners. The successes highlighted in this book come from the government-industry partnerships from several federal agencies and draw upon a diverse set of R&D case studies from across the country.

The body of *Technology Exchange* is organized in six chapters and a summary. The back matter contains an excellent bibliography and glossary followed by seven appendices. Figures, graphs, tables and cartoons are used throughout to illustrate the main points, and a scholar's margin helps highlight key points, making the guide easy to scan and the information easy to use.

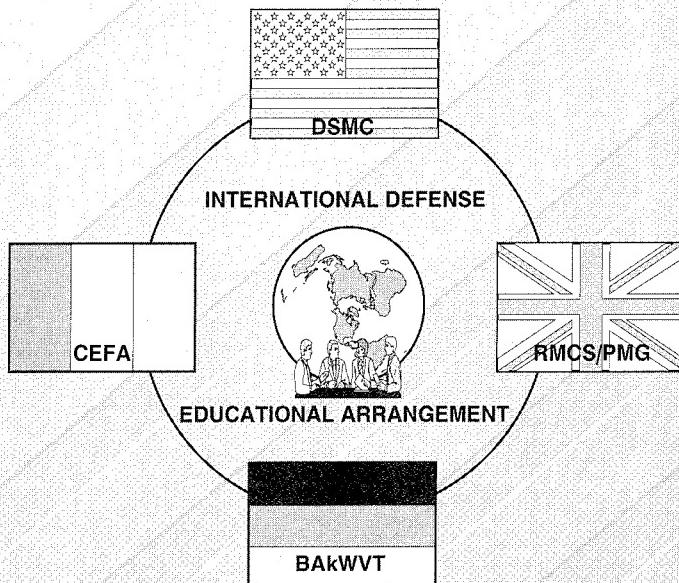
- In Chapter 1, the reader finds an overview of applicable technology transfer policies, background material on the macro- and micro-economic issues, and an introduction to the various methods of technology transfer available to government-industry partners.
- Chapter 2 outlines the present environment for such partnerships, and bluntly captures the perceptions of both Government and industry practitioners of technology exchange. The editors have summarized the perceptions, positive, negative and indifferent, without sugar coating, and give a fair picture of the present-day technology transfer business environment.
- Individual missteps and organizational blunders are not found in this book. However, in Chapter 3 the editors do offer a candid look at the cross-cultural concerns and various hurdles that must be addressed to successfully negotiate and execute a CRDA.
- In Chapter 4, "Building Bridges," the reader is introduced to networking organizations and offered advice on how to structure an effective outreach program.
- Chapter 5 covers a CRDA work plan, negotiations, intellectual property rights, execution of the agreement, and concludes with best practices and lessons learned.
- Chapter 6 takes a look at the various ways one can use to measure progress in the exchange of know-how. This chapter goes well beyond the "CRDA count" metric and suggests better alternatives to managers of cooperative R&D. The role of leadership is addressed next, and helps transition the book to its summary and extensive appendices.
- The detailed information found in appendices A through D documents the genesis of this study, provides organizational and biographical sketches of the research team, summarizes existing technology transfer legislation and executive orders, and defines key terms and jargon. The reader will gain an appreciation for the process of choosing the appropriate technology transfer mechanism in appendix E, based on the knowledge of *who profits, who works, and who pays*. Appendix F lists additional bridging organizations, while appendix G provides a model CRDA.

This book is an excellent contribution to the growing set of documents that is slowly emerging from the experiences in the technology transfer community since the enactment of the 1986 Federal Technology Transfer Act. As a source of reference, the book is a worthwhile addition to any program or R&D manager's professional library.

George K. Krikorian holds the ADPA/NSIA Industry Chair within the Executive Institute of the Defense Systems Management College.



INTERNATIONAL DEFENSE EDUCATIONAL ARRANGEMENT (IDEA) SEMINAR



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Keynote Speaker

*Dr. Paul G. Kaminski, Under Secretary of Defense
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DSMC TO HOST IDEA SEMINAR

The International Defense Educational Arrangement (IDEA) Seminar focuses on international acquisition practices and cooperative programs. Specifically, the seminar is an arrangement between defense acquisition educational institutions in the United States, United Kingdom, Germany and France.

Those eligible to attend are Defense Department/Ministry and defense industry employees from the four IDEA nations who are actively engaged in international defense acquisition programs. Other nations may participate by invitation.

This year the seminar will be held July 10-14, 1995, at the Defense Systems Management College, Fort Belvoir, VA 22060-5565 (near Washington, D.C.). July 14 will be an optional day for those interested in the educational aspects of international acquisition.

The IDEA Seminar is by invitation only. Those U.S. DoD personnel receiving an invitation should submit an approved DD Form 1556 by telefax. Industry representatives should submit letterhead requests by telefax. Invitations and confirmations will be issued after May 1, 1995.

For more information, contact:
Prof. Richard Kwatnoski
Director
International Acquisition Courses
Comm: (703) 805-3064/3063
DSN: 655-3064
Telefax: (703) 805-3187

DSMC ELECTRONIC CAMPUS UPDATE

In our July-August 1994 issue, we published an article about the capabilities of the DSMC Internet to access the file transfer protocol (ftp) server. We apologize for any inconvenience you may have experienced in your attempts to access the *Acquisition Review Quarterly* (ARQ) files through the ftp server. We corrected the problems, and files are now available on the ftp server. Updated instructions and file structures for accessing the ftp server follow:

Internet e-mail addresses at DSMC are in the form "username@dsmc.dsm.mil" where username is normally a person's last name and first initial. (Popular DSMC e-mail addresses, which you may find useful, are shown on this page.)

The DSMC Internet host computer has the ability to send and receive public files through the ftp server. The user may ftp to dsmc.dsm.mil (IP address 198.97.207.254) and log on as "anonymous" with the password "guest." After log-on, open the README file to obtain current information concerning file transfers.

To ftp the *Program Manager* magazine, the *Acquisition Review Quarterly* journal and selected DSMC publications, change to the DSMCPRESS directory. All directory and subdirectory names are case sensitive to CAPS only. Files are in ASCII text; no graphics are included. File structures are as follows:

PROGRAM	ARQ	PUBS
JAN-FEB94	SPR94	GLOSSARY
<filename>.txt	<filename>.txt	<filename>.txt
<filename>.txt	<filename>.txt	<filename>.txt
toc.txt		

If you have acquisition-related files that you wish to share with others, you can ftp them to the UPLOADS directory. After uploading the files, send an e-mail to sysop@dsmc.dsm.mil with file information (filename, type, i.e. ASCII/binary, MSWord Version 6.0 for Windows, etc.) requesting the files be moved from the UPLOADS directory to the PUBLIC directory within the DSMC ftp. These files are accessible to all users.

The College is committed to continually adding information to the ftp server. All current and future files can be accessed using the steps identified above. Our DSMC point of contact is Lt. Col. Tricia Pippin, USA, pippinp@dsmc.dsm.mil, or (703) 805-3462.

POPULAR DSMC E-MAIL ADDRESSES

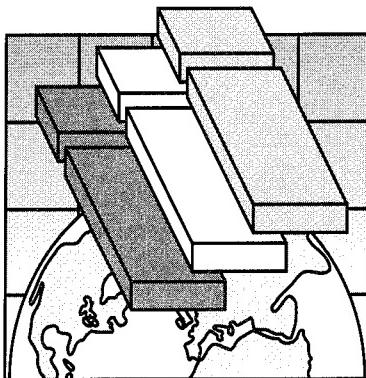
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Mr. Daniel Goldin, Administrator, NASA (invited)

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The graphic features a circular seal of the Defense Acquisition University (DAU) Management College. The outer ring contains the text "DEPARTMENT OF DEFENSE" at the top and "DAU MANAGEMENT COLLEGE" at the bottom. Inside the circle is a shield with a sword, a map, and other symbols, surrounded by the Latin motto "DOCTUS DOCTRINA DOMINA".

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SAE'S JOIN PANEL DISCUSSION WITH DSMC FACULTY AND STUDENTS OF PMC 95-1



Photo by Richard Mattox

Senior Acquisition Executives (SAE) from each Service and members of DSMC's Executive Institute recently met at the College prior to a panel discussion by the SAEs with the students and faculty of the Program Managers Course (PMC 95-1). Pictured from left: Mr. Tony Kausal, DSMC Air Force Chair; Hon. Gil Decker, Senior Acquisition Executive for the Army; Hon. Clark Fieste, Senior Acquisition Executive for the Air Force; Hon. Nora Slatkin, Senior Acquisition Executive for the Navy; Mr. Gibson LeBoeuf, DSMC Navy Chair; and Mr. George Krikorian, DSMC Forrestal-Richardson Memorial Industry Chair.

INDUSTRY AND THE INTERNATIONAL TEST AND EVALUATION ASSOCIATION (ITEA) CROSSTALK SYMPOSIUM

The George Washington (GW) Chapter of ITEA is sponsoring 1½-day symposium beginning in the a.m., July 18, 1995, at the Sheraton Crystal City, in Arlington, Virginia. Industry representatives will participate in panel discussions of goals, processes, experiences, problems and suggestions relative to their product test and evaluation. Following each panel discussion, a select panel of test and evaluation executives from DoD and other government agencies will initiate dialogue with panel members to further explore test and evaluation concepts of mutual benefit. Questions from the audience will be entertained.

The cost for ITEA members and members of government is \$175. For non-ITEA members, the cost is \$215. (Membership in ITEA costs \$40.) Cost includes continental breakfasts, refreshments during breaks, and the ITEA-GW Chapter luncheon on 18 July. Mr. John Burt, OUSD(A&T), DTSE&E, is the symposium host and overall chair. Honorable Philip Coyle, DOT&E, will be the luncheon speaker. For further information, contact Dr. Vernon Shirley, MATRIX Corporation, (703) 893-1212 (Voice) or (703) 356-6578 (Telefax); or Ms. Brenda Rawlins, TRW, (703) 413-3151 (Voice) or (703) 413-5116 (Telefax).

FROM THE COMMANDANT

Hello. It has been awhile since I talked to you, and I have a lot to tell you about the College. As I mentioned in past articles, we have been busy responding to the acquisition workforce in the field. This has resulted in several new/updated courses for DSMC. In the program management area, we have four new courses which now have had several offerings. They are the Fundamentals of System Acquisition Management Course (FSAMC) or ACQ 101, the Intermediate Systems Acquisition Course (ISAC) or ACQ 201, the Advanced Program Management Course (APMC) or PMT302, and the Executive Program Managers Course (EPMC) or PMT303. All are doing well. The APMC is the new shortened PMC (14 weeks vs. 20 weeks), which requires the prerequisite ACQ 201 or Defense Acquisition Career Manager's approval to attend. We started the first offering to that on 6 Mar 95 with two sections of the current PMC 95-1 class. The rest of the PMC 95-1 class started 6 weeks earlier with the regular 20-week PMC. The entire class will graduate on the same day. From that point on, only the 14-week APMC will be offered. The next APMC offering will be Sep 95.

In the world of software, responding again to the needs of the workforce, DSMC, in partnership with the Information Resources Management College, is developing two new courses addressing software management concerns.



I continue to make semiannual trips to the field to talk to the commanders and staffs of the Service acquisition headquarters. Additionally, I have talked to a number of students and faculty in our four DSMC regions. The reasons for these visits are twofold. First, to gather/validate workforce requirements and trends in my role as chairman of the Acquisition Management Functional Board. Second, to gather/validate the same requirements and trends in my role as Commandant of DSMC.

The results have been the courses and organizational changes I have mentioned here and in past articles. My staff and I will continue to do this to keep us current and proactive in responding to you.

One of the growing concerns that surfaced during my recent visits is the confusion and proliferation of educational requirements coming from the various functional boards created in response to the Defense Acquisition Workforce Improvement Act. Many in the field believe that since the field is using integrated product/process team concepts, the functional boards should do the same and integrate their efforts. We at DSMC are working that concern, and I will let you know how we are doing at a later date.

As always, DSMC is here to help you. Let us know how we can help you or how we can improve our service to you. Till the next time...

— Brig. Gen. Claude M. Bolton, Jr., USAF
Commandant